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BASIS OF DIAGNOSTICS OF THYROID DISEASES

METHODICAL MANUAL

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of Zaporizhzhia State Medical University*

This is recommended for the educational process for foreign students.

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The manual outlines the basics of modern knowledge on the diagnosis of thyroid gland diseases. For students of higher medical educational institutions of III-IV levels of accreditation.

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CONTENT

List of conditional abbreviations	4
Introduction	5
1. Actuality of theme	5
2. Educational objectives.....	5
3. Basic knowledges, skill needed to study the topic (interdisciplinary integration).....	8
4. Materials of pre-class independent work	10
4.1. List of main terms, parameters, characteristics, which should be learned by the student while preparing for the lesson	10
4.2. Theoretical questions to the lesson.....	11
4.3. Practical tasks performed at the lesson	11
5. Content of the topic	12
5.1. List of used literature	43
5.2. List of recommended literature	45
6. Tasks and materials for post-class independent work.....	47
Addition 1. Abbreviations used in the results of laboratory and instrumental tests.....	70
Addition 2. Basic laboratory parameters and their interpretation	71
Addition 3 Algorithm for evaluating the function of the thyroid gland	72
Addition 4 The algorithm for managing patients with toxic diffuse goiter.....	73
Addition 5 Algorithm for managing patients with nodal forms of goiter	74
Addition 6 Diagnostic criteria for major diseases of thyroid glang.....	75

LIST OF CONDITIONAL ABBREVIATIONS

AB-TG	- Antibodies to thyroglobulin
AB-TPO	- Antibodies to thyroid peroxidase
AB-rTSH	- Antibodies to TSH receptors
TDG	- Toxic diffuse goiter
ELISA	- Enzyme-linked immunosorbent assay
CT	- Calcitonin
MRI	- Magnetic resonance imaging
FNAB	- Fine needle aspiration biopsy
TG	- Thyroglobulin
TSH	- Thiorotropic hormone
T3	- Triiodothyronine
f T3	- Free Triiodothyronine
T4	- Thyroxine
f T4	- Free Thyroxine
USD	- Ultrasound diagnostics
TG	- Thyroid gland

Introduction

The expediency of preparing an educational publication is due to the need to make changes in the organization of the educational process in accordance with the requirements of the new program of the discipline "Internal Medicine". In recent decades, thyroid diseases occupy a leading place in the structure of endocrine pathology, along with type 2 diabetes. The program of the discipline notes the need to improve the professional competence of students in the early diagnosis of thyroid diseases based on improving the skills of physical examination, interpreting the results of laboratory and instrumental examination, differential diagnosis and justifying the clinical diagnosis of patients with thyroid pathology based on the principles of evidence based medicine, also the acquisition knowledge of medical ethics and deontology [2,9].

1. Actuality of theme:

Diseases of the thyroid gland are one of the most actuality medical and social problems due to the growing prevalence of thyroid pathology in Ukraine, also high temporary and permanent disability. According to the Ministry of Health of Ukraine over the past 5 years, the number of thyroid diseases has increased fivefold. Thyroid pathologies occupy 47.3% of the total structure of endocrine diseases [9]. This requires increasing of the requirements for study methods for the early diagnosis of thyroid diseases. The purpose of the publication of this methodical manual is to promote the study of clinical, laboratory and instrumental methods for the diagnosis of diseases of the thyroid gland by students.

2. Educational goals:

- Acquire and improve knowledge on the diagnosis of thyroid disease.
- Assimilation of features of anamnesis collection at main diseases of the thyroid gland.
- Development of a method for determining the basic diagnostic criteria for clinical diagnosis of thyroid gland diseases.
- Studying of the technique of palpation and determining the size of the thyroid gland.
- Teach students to evaluate objective data, analyze the results of laboratory and instrumental examination methods for the diagnosis of main diseases of the thyroid gland.
- Improvement of the method of differential diagnosis of thyroid gland diseases.
- Teach students how to justify and formulate diagnoses of the main diseases of the thyroid gland.

Student should know:

- Biological effect of thyroid hormones on the body and the mechanism of regulation of thyroid function.
- Blood hormones level.
- Main diseases of the thyroid gland: definition and risk factors.
- Symptoms of main diseases of the thyroid gland.
- Diagnostic criteria for main diseases of the thyroid gland.
- Classification of thyroid gland enlargement.
- Methods for evaluating the functional state of the thyroid gland.
- Indications for conducting and analyzing the results of hormonal studies and trials.
- Diagnostic value of ultrasound and radioisotope examination of the thyroid gland.
- Diseases with which it is necessary to differentiate the pathology of the thyroid gland

Students should be able to:

- To conduct a survey, physical examination of patients with major thyroid gland diseases.
- Conduct palpation of the thyroid gland.
- Detect a typical clinical picture, variants of the course and complications of the basic diseases of the thyroid gland
- Demonstrate necessity of performing invasive and non-invasive diagnostic methods and determining the indications and contraindications, possible complications in in patients with thyroid gland pathology.
- Interpret the results of lipid, protein, carbohydrate and hormonal tests.
- Analyze the results of ultrasound and radioisotope thyroid gland examination, result of functional tests.
- To conduct a differential diagnosis based on data analysis of clinical, laboratory and instrumental examination.
- Recognize less common endocrine diseases and send a patient to an endocrinologist (a thyroid gland tumor).
- Recognize endocrinological causes of syndromes: arterial hypertension and arterial hypotension, edema syndrome.
- To substantiate and formulate the diagnosis of main diseases of the thyroid gland.
- Demonstrate moral and deontological principles of a medical specialist and principles of professional subordination.

3. Basic knowledge and skills are needed to study the topic (interdisciplinary integration)

Previously studied discipline	Know	Skills
Human anatomy	Topography of the neck.	Topographic landmarks of the thyroid gland
	The anatomical structure of the thyroid gland, syntopy of the thyroid gland.	
	Topographic anatomy of the recurrent nerve and parathyroid glands	
Histology	Histological structure of the thyroid gland.	
	Histological structure of the parathyroid glands	
Normal physiology	Thyroid function, physiological functions of thyroid hormones, hormonal and nervous regulation of thyroid function.	Evaluate the condition of the thyroid gland function.
Pathological physiology	Pathogenesis of thyroid dysfunction.	Evaluate the results of the study of thyroid function.
Pathological anatomy	Histological forms of tumors and cysts of the thyroid gland, differential diagnosis between cancer, acute and subacute thyroiditis and thyroid gland adenomas.	To evaluate the results of pathologist examination of thyroid gland tumors
Propedeutics of internal diseases	Examination of the neck and glands of the inner secretion. Clinical	Perform a physical examination of patients with thyroid gland

	manifestations and methods of diagnosis of diseases of the thyroid gland.	diseases.
Interdisciplinary integration		Perform a differential diagnosis of diseases of the thyroid gland with another pathology.
Internal disease	Changes in internal organs in diseases of the thyroid gland, their differential diagnosis, the main methods of treatment	
Pediatrics	Features of the course of thyroid pathology in childhood	
Obstetrics and gynecology	Features of the course of thyroid diseases during pregnancy, their influence on the development of the fetus	
Neurology and psychiatry	Psychoneurological manifestations of thyroid pathology.	

4. Materials for independent work.

4.1. List of main terms, parameters and characteristics which must be mastered by the student in preparation for the class

Term	Definition
1. Nontoxic diffuse goiter	Diffuse enlargement of the thyroid gland without dysfunction
2. Toxic diffuse goiter	Disease with increased secretion of thyroid hormones, diffuse enlargement of thyroid gland and ophthalmoplegia
3. Thyrotoxicosis	Syndrome caused by prolonged increasing of T3 and T4 hormone level in blood and tissues with specific clinical manifestations
4. Hyperthyroidism	Increasing of secretion of thyroid hormones by thyroid gland
5. Hypothyroidism	Decreasing of secretion of thyroid hormones by thyroid gland
6. Endemic goiter	Enlargement of thyroid gland occurs in most people who live in geographic regions where there is lack of iodine in environment
7. Thyroiditis	Group of thyroid gland diseases which differ in their etiology and pathogenesis, morphological picture and clinical course, but common component is certain type of inflammation
8. Thyroid nodules	Presence of heterogeneous focal lesions of the thyroid gland

4.2. Theoretical questions to the lesson:

- Hormones of the thyroid gland, regulatory mechanisms.
- Thyroid hormone functions.
- Classification of thyroid gland diseases.
- Definition of the concept of diffuse toxic goiter, hypothyroidism, autoimmune thyroiditis, endemic goiter.
- Clinical picture of main diseases of the thyroid gland, criteria for diagnosis.
- Methods of diagnosis of thyroid gland diseases.

4.3. Practical task:

- Collect complaints, anamnesis of life and illness.
- To examine the patient.
- Identify early signs of thyroid disease.
- Give an assessment of the results of additional survey methods

5. CONTENTS

Anatomy of the thyroid gland

Thyroid gland is located on the front surface of the neck, between the thyroid cartilage and 5-6 rings of the trachea. In some cases, the location of the thyroid gland has an ectopic nature: the root of the tongue, the hyoid bone or mediastinum. The gland consists of the right and left lobe and isthmus. In 30-40% there is a pyromidal appendix. The weight of the thyroid gland depends on the age of the person, the average weight in adults is - 15-25 g. Table 1 provides data on the weight of the thyroid gland in different age periods[1,16,18].

Table 1: Age-related changes in the mass of the thyroid gland

Age	newborn	6 m	7-12 m	Up to 2 years	3-4 years	5-10 years	11-15 years	16-20 years
Weight, gr	1	2	3	4	7	10	10-15	15-25 10-20

On the outer capsule of the thyroid gland there are located parathyroid glands (two or more on each side). In most cases they are located at the level of the middle third of lateral lobes of the thyroid gland on its posterior internal surface, but may be localized at the upper and lower pole or particles on their front surface, rarely - in the parenchyma.

Blood supply is due to the upper and lower thyroid arteries; venous blood goes back to the same veins (the system of the upper vena cava). Innervation: branches of the vagus nerve and cervical part of the sympathetic trunk. Lymphatic drainage occurs to the deep lateral cervical, pre- and paratracheal lymph nodes n (fig. 1). [1,7].

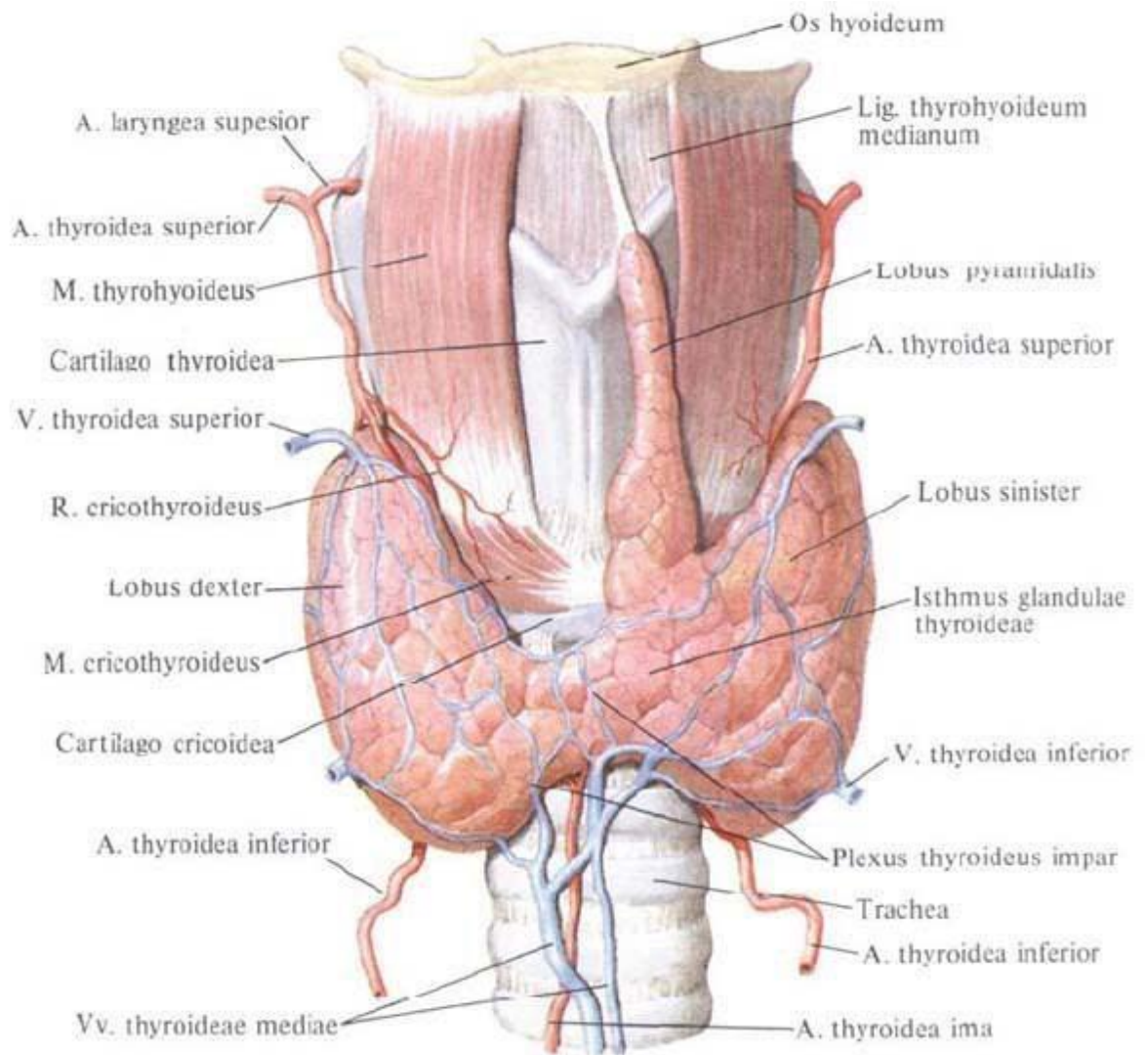


Fig.1 Topography of the thyroid gland. Blood vessels of the thyroid gland. (Bilich G.L.,2013.)

The structural and functional unit of the thyroid gland is a follicle. Its wall has one layer of epithelial cells - thyroid cells, and in the lumen contains colloid (fig.2). Epithelial cells are represented by 3 types [5,22]:

- ✓ Type A - active follicular cells lining the follicle and participating in the metabolism of iodine and the synthesis of thyroid hormones;
- ✓ Type B - small-differentiated (cambial) cells that serve as precursors in the formation of A-cells;
- ✓ Type C - parafollicular cells are located between the follicular cells, they are involved in the synthesis of calcitonin.

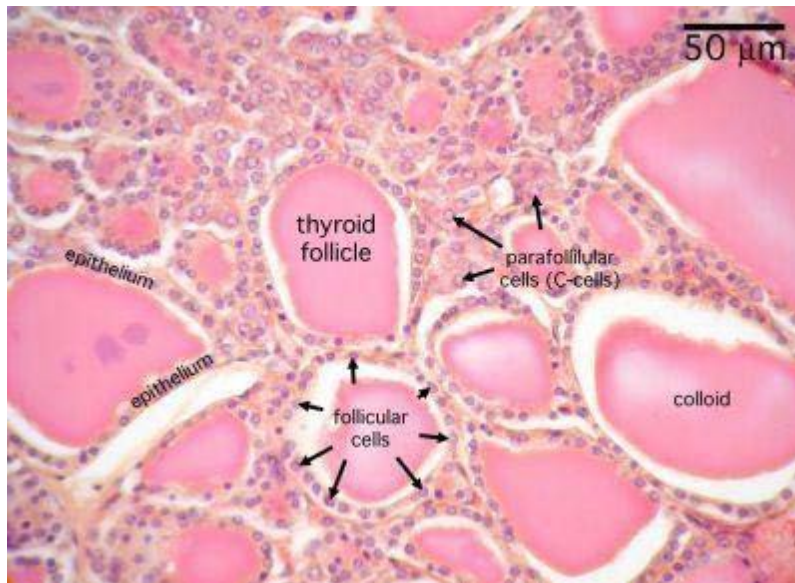
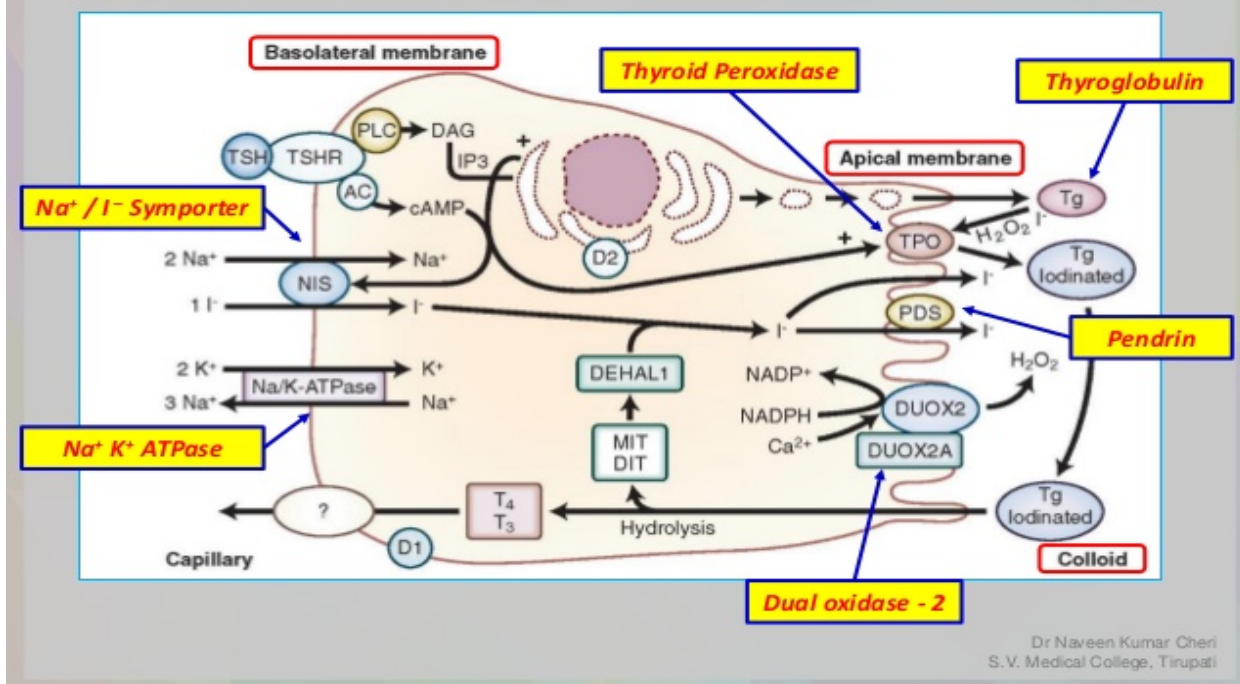


Fig. 2. The structure of the thyroid gland follicles (Y. I. Afanasyev and E. F. Kotovsky 2013).

The thyroid gland secretes three main hormones: triiodothyronine (T3), thyroxin (T4) and calcitonin. The main components necessary for the formation of hormones are iodine and tyrosine. Iodine enters the body with food and water. In the blood, iodine compounds form potassium and sodium iodides, which penetrate the epithelium of the gland follicles. In the cells of the follicles, iodine ions are converted to atomic iodine by the action of peroxidase and are attached to thyroglobulin or tyrosine. Iodinated tyrosine does not have hormonal activity, and is a substrate for the formation of thyroid hormones T3 and T4 (the result of the connection of two iodinated forms of tyrosine) (fig.3) [5,22,23].

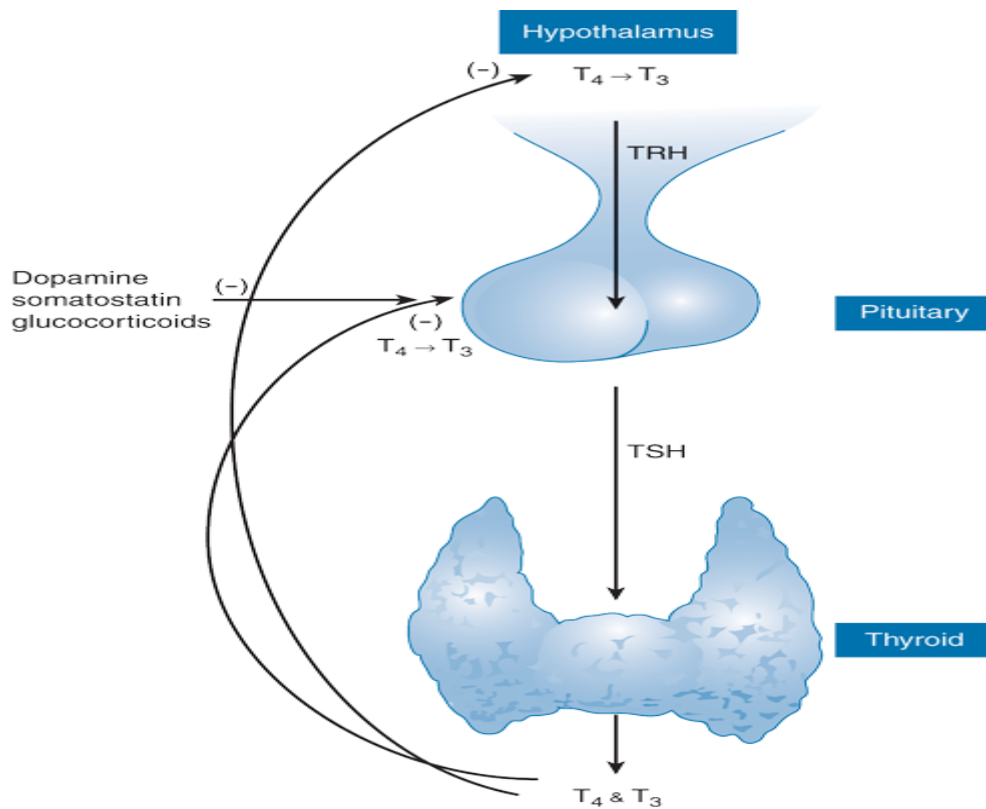
The thyroid gland produces calcitonin, a polypeptide containing 32 amino acids. This hormone directly affects the metabolism of phosphorus and calcium and is an inhibitor of osteoblast activity and activates osteoblasts, thereby preventing bone resorption. The mechanism of action of calcitonin is associated with an effect on specific osteoblast receptors [5, 6,22,23].

Synthesis & secretion of thyroid hormone



Regulation of synthesis and secretion of thyroid hormones.

The regulation of synthesis and secretion of thyroid hormones is carried out through the hypothalamic-pituitary system. Thyrotropin-releasing hormone is the main hormone of the hypothalamus, which is constantly released through cAMP and causes secretion of adenohypophysis from thyrotropin (TSH) cells. The somatostatin inhibits this process. The secretion of thyrotropin-releasing hormone and TSH is fairly constant and increases when the temperature of the environment decreases. TSH interacts with the membrane receptors of the epithelial cells of the follicles and, through its intermediaries, stimulates the synthesis and secretion of the thyroid hormones. In this case, the iodide is captured by the thyroid gland, the synthesis of thyroglobulin, the hydrolysis of the thyroglobulin molecules in the follicles, the secretion of T₄ and T₃ in the blood. [5,6,7].



Source: Molina PE: *Endocrine Physiology*, 4th Edition: www.accessmedicine.com
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Fig.4 Regulation of secretion of thyroid hormones

Physiology of the thyroid gland.

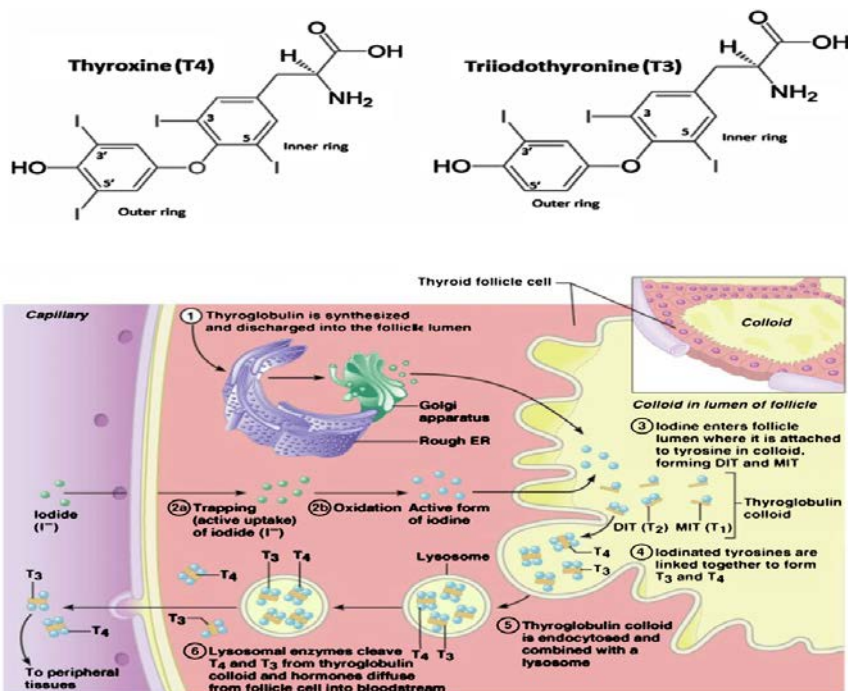


Fig. 5. Hormones of the thyroid gland

Thyroxine (T4, tetraiodothyronine)

Thyroxine is produced by A cells of the thyroid gland from tyrosine and iodine atoms. Only a small part (0,03%) is in free form, but this particular part determines the biological activity of the hormone.

The maximum concentration of thyroxine during the day is determined from 8-00 to 12-00 hours, the minimum at night from 23-00 to 3-00 hours. In men, the concentration of thyroxin is higher than in women. During the year, the maximum concentration of thyroxin is observed in the summer and the minimum in the period from September to February [5].

Triiodothyronine (T3). About 80% of the total amount of triiodothyronine is formed as a result of dehydrogenation of thyroxine in peripheral tissues (liver and kidneys), and 20% is secreted by the thyroid gland. The content of free triiodothyronine is about 0.3% of the total serum hormone content, triiodothyronine is mainly associated with thyroxin-binding globulin. Triiodothyronine has seasonal changes: the maximum concentration is observed from September to February, but in the summer it is minimal. The physiological decrease in triiodothyronine in men and women is observed after 65 years. Table 2 shows the physiological effects of triiodothyronine and thyroxin on organs and body systems [5].

Table 2.

Biological effects of triiodothyronine and thyroxine

Organs and systems of organism, metabolism	Physiological action of thyroid hormones
Carbohydrate metabolism	Activation of glucose catabolism
Lipid metabolism	Activation of lipolysis, increasing cholesterol excretion with bile
Protein metabolism	Stimulation of protein synthesis
BX (basal metabolism)	Increasing of BX and appetite
Cardio-vascular system	Increasing of chronotropic and isotropic functions of the heart
Nervous system	Increasing of sympatic nervous system effects, perception of the formation of

	cognitive functions, ensuring adequate functioning of neurons in adults
Reproductive system	Regulation of fertile function and lactation
Musculoskeletal system	Regulation of skeletal maturation and formation
Kidneys	Decreasing of sodium reabsorption

Evaluation of physical examination of the thyroid gland

The evaluation of the physical examination begins with an external review. An external review allows to establish the characteristic manifestations of thyroid gland (thyrotoxicosis, hypothyroidism). The patient's appearance is an expressionless and puffy face with hypothyroidism, restless, with wide eyes and a fearful glance – with thyrotoxicosis. When examining a patient with a retrosternal goiter, sometimes swelling of the subcutaneous veins of the neck, Horner's syndrome (ptosis, miosis, enophthalmos) can be seen when the sympathetic trunk is compress[11,12].

Thyroid Examination Techniques:

- The patient should be asked to stand or sit, looking in front of himself. The neck muscles should be relaxed, and the neck should be slightly unbent. It is necessary to begin a review of the neck 2 centimeters above the clavicle, trying to see the lower borders of the thyroid gland between the sternocleidomastoid muscles. Then you should inspect the isthmus of the thyroid gland (below the cricoid cartilage). In conclusion, you can see the upper borders of the thyroid gland [11,12].

- ask the patient to tilt his head a little. If the thyroid gland is low, it will rise up. The skin above it is stretched, and the gland is better visualized.

- a review of the gland from the side makes it possible to identify possible abnormalities or protrusions.

In the end, you need to evaluate the state of the veins of the neck and identify all possible pathological changes.

When you look at the thyroid gland you can determine (Fig.6):

- Location of the gland
- Size
- Form
- Symmetry
- Surface condition
- Degree of mobility of the gland during swallowing.



Fig 6. Changes in the thyroid gland during physical examination (<https://medfactor.ua>).

Symptoms that are observed in diseases of the thyroid gland[11,12].

Maranon's sign — this is redness (sometimes with itching) of the skin, located directly above the thyroid gland. Symptom is observed in DTG.

Pemberton's sign. To test this symptom, you should ask the patient to raise his arms above his head. If nothing happens within three minutes, the symptom is considered negative. On the contrary, the symptom is considered to be positive if the patient develops cyanotic or pink coloration of the neck and / or face as a result of venous congestion, feeling of heaviness in the head, dizziness or congestion in the ears. This is due to the obstruction of the upper ventricular vein with a

retrosternal goiter. In other words, the goiter closes the entrance to the chest cavity and prevents the venous outflow.

Palpation of the thyroid gland is performed in various ways, including palpation with one or two hands from the front or back approach.

Most specialists prefer palpation of the thyroid gland from the front approach. While standing up to the patient, palpate each part of the gland with the thumb and forefinger of one hand or two hands, as shown in the figure below.



Fig. 7. Palpation with two hands from the front access (Pankiv V.I., 2010)

Gland can be palpated with two hands from the back approach. The doctor stands behind the patient and places the tips of the second and third fingers of both hands on the middle line of the neck. They should be placed on the width of the finger (2 cm) above the sternal notch and 1.5 cm inwardly from the medial edge sterno-cleido-mastoid muscles. From this position, they first try to identify the isthmus (below the cricoid cartilage and above the sternum notch), and then palpate the lobes of the thyroid gland (Fig. 8).



Fig. 8. Palpation by two hands from the back access (Methods of research of the function of the thyroid gland, ed. Pankiv V.I., 2010)

It is not always possible to palpate the normal thyroid gland. The thyroid gland weighing 15–20 g. (the upper limit of normal) is difficult to palpate, and the thyroid gland weighing 10–15 g. is not palpable at all [11,12].

When conducting palpation of the thyroid gland it is necessary to pay attention to the following characteristics:

- the size of the gland;
- the increase of the thyroid gland (diffuse, nodular or mixed);
- Properties of the surface - smooth or covered with bulbs;
- consistency (soft-elastic or dense);
- mobility;
- cohesion with the surrounding tissues;
- sensation of the patient during palpation

Classification of Goiter Size (WHO, 2001)

Grade 0 – the normal size of the thyroid gland. On palpation, each lobe of the thyroid gland does not exceed the size of the distal phalanx of the thumb.

Grade I– The thyroid gland is not visible to the eye, but is visible when swallowing. The size of each lobe is larger than the distal phalanx of the thumb. At the same time, one or several nodes are palpable against the background of a gland of normal size.

Grade II– Goiter is palpable and visible to the eye (Fig 9).



Fig.9. Goiter stage II (<https://medfactor.ua>)

Percussion of the thyroid gland. With this method, determine the borders and localization of the gland. The most informative is this method of examination in patients with retrosternal and intrathoracic goiter.

In the diagnosis of diseases of the thyroid gland auscultation has limited value. Auscultation is performed on the area of the gland by the phonendoscope. The presence of noise is observed in thyroid toxicity, which are due to increased blood flow. In patients with thyrotoxicosis auscultation is found constant noise at the level of the upper poles of the gland, which increases during systole. If trachea is compressed by enlarged gland, auscultation is detected as a whistling sound. [6,7,11,12].

Laboratory diagnostics

As part of thyroid disease is a disease of hyperfunction (hyperthyroidism), lack of function (hypothyroidism), inflammation (thyroiditis), enlarging (goiter) and the appearance of it malignancies. Autoimmune thyroid lesions occupy a special place. Taking into account the high prevalence of thyroid diseases, timely and complete diagnosis is important [17,19].

Currently, the assessment of the functional status of the thyroid gland includes a number of methods: clinical, laboratory and instrumental (ultrasound, radiological, pathomorphological). Laboratory methods for the study of thyroid gland are divided into the following groups [11,12]:

- **Functional markers:**

TSH, general T4, free T4, general T3, free T3

- **Markers of autoimmune pathology:**

AB-TG, AB-TPO, AB-TSH

- **Markers of oncological pathology:**

Thyroglobulin (TG), Calcitonin (CT)

In diseases of the thyroid gland, all laboratory tests are divided into diagnostic tests of different levels:

- ✓ First-level diagnostic tests determine the level of TSH that is necessary to differentiate the state of eutroism from hypo- and hyperthyroidism
- ✓ diagnostic tests of the second level determine the level of free T4 which necessary to confirm the presence of hypothyroidism and hyperthyroidism
- ✓ diagnostic tests of the third level determine the level of general T3 or free T3 which necessary only for the diagnosis of rare T3-thyrotoxicosis

The key hormonal markers of thyroid gland diseases are TSH, free T4 and free T3. The method of immunoassay (ELISA) determines the concentration of

these hormones in serum. The level of TSH in the bloodstream is a strategic marker of the functional state of the thyroid gland. Diagnostic values of levels of hormones are presented in Table 3.

Table 3

Diagnostic value of thyroid hormones levels:

Thyroid function	Euthyroidism	Subclinical dysfunction		Manifest thyrotoxicosis	Manifested hypothyroidism
		subclinical hypothyroidism	subclinical thyrotoxicosis		
TSH	Normal	Increased	Reduced	Reduced	Increased
fT ₄	Normal	Normal	Normal	Increased	Reduced
fT ₃	Normal	Normal	Normal	Increased	Reduced/Normal

TSH is a hormone synthesized by the cells of the anterior lobe of the pituitary gland under the influence of the releasing factors of the hypothalamus. Its synthesis is regulated under the influence of the feedback system to the level of active forms of thyroid hormones [12,21].

Indications for the determination of blood TSH level are:

- ✓ Screening test of TSH (it is recommended not only in pregnant and newborns, but also in adults over the age of 35 (women) and 50 (men) at intervals of 5 years);
- ✓ Diagnostics of thyroid function disorders;
- ✓ Confirmation of the diagnosis and differentiation of the forms of central and peripheral hypo- or hyperthyroidism
- ✓ Suspicion of autoimmune thyroiditis and thyroid cancer (in the dynamics of the disease).
- ✓ Screening of congenital hypothyroidism

Thyroxine (T4) is produced by A-cells of the thyroid gland from tyrosine and iodine atoms. Only a small part (0.03% of T4) is in free form, but this particular

part determines the biological activity of the hormone. The total blood levels of total thyroxine (T4) in healthy individuals are in the range of 64-146 nmol / l. The concentration of free T4 does not depend on the concentration of binding proteins and is 11-25 pmol / liter [4].

Indications for determining blood levels of thyroxine are:

- ✓ Diagnostic of thyroid function;
- ✓ Observing the patient's condition during treatment

The value of determining the level of thyroxine in the diagnosis of thyroid diseases:

- ✓ With hyperthyroidism, the concentration of free T4 is increased, the TSH concentration is reduced;
- ✓ With "isolated" T3 hyperthyroidism, the concentration of free T4 may be increased and the concentration of total T4 does not exceed the norm;
- ✓ At the early stage of hypothyroidism, the concentration of free T4 decreases earlier than the concentration of total T4. The diagnosis is confirmed in case of an increase in the concentration of TSH or a positive response to the TRG-stimulating test.

Triiodothyronine (T3). About 80% of the total T3 is formed as a result of dehydrogenation of T4 in peripheral tissues (liver and kidneys), and 20% is secreted by the thyroid gland. Free T3 content is about 0.3% of the total serum hormone content, as in the case of free T4, the free T3 content does not depend on the concentration of binding proteins. T3 is mainly associated with thyroxin-binding globulin.

Total blood T3 in healthy individuals is in the range of 1.82-8 nmol / l. The concentration of free T3 does not depend on the concentration of binding proteins and is 4.49-9.3 pmol / l. [4].

Table 4.

Physiological conditions and diseases that lead to changes in the level of triiodothyronine in the blood

Increase T3	Decrease T3
Men and women over 65 years old	With an increase in body weight
Weight loss in patients	With physical exercises
Bad nutrition with low protein content, low calorie diet	During pregnancy (especially in the 3rd trimester)
After abortion	With hemodialysis
In premature newborns	
With acute diseases	
Electro-pulse therapy	
Hyperthermia	
Plasmapheresis	

Markers of autoimmune pathology. Most hyper- and hypofunction thyroid gland are autoimmune diseases. The most well-known components of the thyroid gland are thyroglobulin (TG), TPO, and receptors for TSH, to which immune reactions occur and antibodies are produced [4].

Ab-TG is an antibody to TG, a precursor of thyroid hormones. Antibodies bind thyroglobulin, breaking the synthesis of hormones and thereby causing hypothyroidism. Determination of antibodies to TG is performed for assessing of severity of autoimmune reactions in thyroid diseases. Antigens to TG are markers of autoimmune chronic thyroiditis (Hashimoto's disease), Graves' disease and idiopathic myxedema. Antibodies to thyroglobulin are found in patients with thyroid cancer in the presence of regional metastases.

AB-TPO:

Thyroid peroxidase is a protein that plays an important role in the iodizing process of the hormones T3 and T4 and is a major component of the thyroid microsomal antigen. Iodide should be oxidized to the active form with thyroperoxidase and hydrogen peroxide, for further use for the synthesis of thyroid

hormones. The iodide activated in this way (J +) is capable of iodizing the tyrosine molecule to form monoiodotyrosine or diiodotyrosine. Inhibition by specific autoantibodies (anti-TPO) of peroxidase activity reduces the synthesis of thyroid hormones and, as a result, leads to hypothyroidism.

Indications for definition of the quantity of Ab-TPO and Ab-TG level in blood is:

- ✓ Chronic thyroiditis (Hashimoto type);
- ✓ Hyperthyroidism in newborns;
- ✓ Hyperthyroidism (Basel's disease)

Antibodies to the TSH receptor. Antibodies to TSH receptors play an important role in the pathogenesis of autoimmune inflammatory processes in the thyroid gland and can directly stimulate the thyroid function, or block the biological effects of TSH. The test for determination of AB-rTSH has a high specificity (97-100%).

Basic indications for determining the level of AB-rTSH:

- ✓ differential diagnosis of causes of thyrotoxicosis;
- ✓ thyrotoxicosis in pregnant women;
- ✓ For women with remission of hyperthyroidism who are planning pregnancy;
- ✓ neonatal hyperthyroidism;
- ✓ To select the best tactics for patients with hyperthyroidism and to predict the timing and duration of conservative therapy;

This test is irreplaceable in predicting the course of the disease and choosing the best treatment tactics. Thus, in the course of conservative therapy of thyrotoxicosis in patients, control of the level of AB-rTSH allows to determine the probability of remission or relapse. The risk of relapse increases with an increased level of antibody data. Of particular importance is the increase in the level of AB-rTSH in the III trimester of pregnancy in pregnant women with hyperthyroidism because these antibodies can penetrate the fetoplacental barrier, affecting the fetus, promote the development of prenatal and neonatal hypothyroidism. Testing of

titres of AB-rTSH in newborns is used for differential diagnostics of immune neonatal hypothyroidism with other forms of this disease [4, 6].

Table 5

Frequency of detection of antibodies in autoimmune inflammatory processes of the thyroid gland (PN Bodnar, 2002)

Condition	AB-TPO	AB-TG	AB-rTSH
Chronic thyroiditis	95%	70%	100%
Diffuse toxic goiter	70%	30%	90%
Healthy people	3%	1%	2%

Markers of oncological pathology

Thyroglobulin (TG) is a protein substrate in the formation of thyroid hormones. Determination of TG is very important for monitoring the treatment of differentiated thyroid cancer - its content in relapse and metastasis increases. After total thyroidectomy, the TG content in serum is sharply reduced and is less than 5 ng / ml. Increase in the postoperative period of TG level in serum above 10 ng / ml indicates a relapse or the appearance of thyroid cancer metastases.

Calcitonin. For the diagnosis of medullary carcinoma of the thyroid gland, the determination of calcitonin is of paramount importance. Determination of calcitonin is used as a screening test for family members of patients with this type of cancer (20% of cases of this form of cancer have a family nature). Changes in calcitonin levels in patients with medullary carcinoma of the thyroid can indicate the non-radicalization of the operation or the presence of distant metastases or the relapse of the disease after surgery. Marker of iodine deficient states is an estimate of the amount of iodine released from the urine (ioduria). This method is recommended only for the characterization of iodine secretion in epidemiological research. [4,10,12, 21].

Instrumental methods

To instrumental methods of examination of patients with pathology of the thyroid gland include ultrasound examination of thyroid gland, scintigraphy, biopsy, X-ray examination, computer and magnetic resonance imaging, laryngoscopy [8, 11,12,17].

Ultrasound examination of the thyroid gland

This is a basic instrumental method which allows you to determine with great accuracy the size of the thyroid gland, calculate its volume, mass and degree of blood supply. It also detects the presence of nodes and cystic lesions. It is used not only to estimate the prevalence of goiter in the population, but also to monitor the dynamics of treatment or prevention.

Ultrasound technique. In the process of thyroid ultrasound, the patient lays on the couch with a slightly thrown back head. On the naked part of the neck is applied a gel, scanning is done by an ultrasonic sensor with minimal pressure on the skin. Ultrasound does not cause pain, can be repeated many times. (Fig.10)



Fig.10. Ultrasound examination of thyroid gland (<https://medfactor.ua>)

An important question, which is answered by an ultrasound, is an assessment of the volume of thyroid gland. The most common method of ultrasound determination of the thyroid gland volume is Brun's technique (1981). The estimation of the volume of particles is carried out according to the formula for calculating the volume of the ellipsoid, while the volume of each particle is calculated by multiplying the thickness (T), width (W) and length (L) with the correction coefficient on the ellipsoidal structure of the lobe (0.479):

$$\text{Volume} = [(T1 * W1 * L1) + (T2 * W2 * L2)] * 0,479.$$

According to international standards, in adult goiter is diagnosed if the thyroid volume exceeds 18 cm³ in women, and 25 cm³ in men.

When evaluating a thyroid gland ultrasound, there are several major issues:

- ✓ Assessment of the location of the gland;
- ✓ Evaluation of the structure of the gland
- ✓ Estimation of contours of the gland;
- ✓ Assessment of the size of the gland;
- ✓ Evaluation of the structure of the gland (in the norm - homogeneous, has a characteristic granularity, with inflammatory processes becomes moderate or expressed heterogeneous);
- ✓ Estimation of echogenicity of the thyroid gland (echogenicity is the "color" of the tissue of the thyroid gland on the screen of the ultrasound apparatus);
- ✓ Description of the available focal formations in the thyroid gland (nodes, calcinates or cysts);
- ✓ Description of the structure of regional cervical lymph nodes.

Fig. 11 representing different ultrasound standards and thyroid disease (sonographic atlas of ultrasound images (for doctors) 2017).

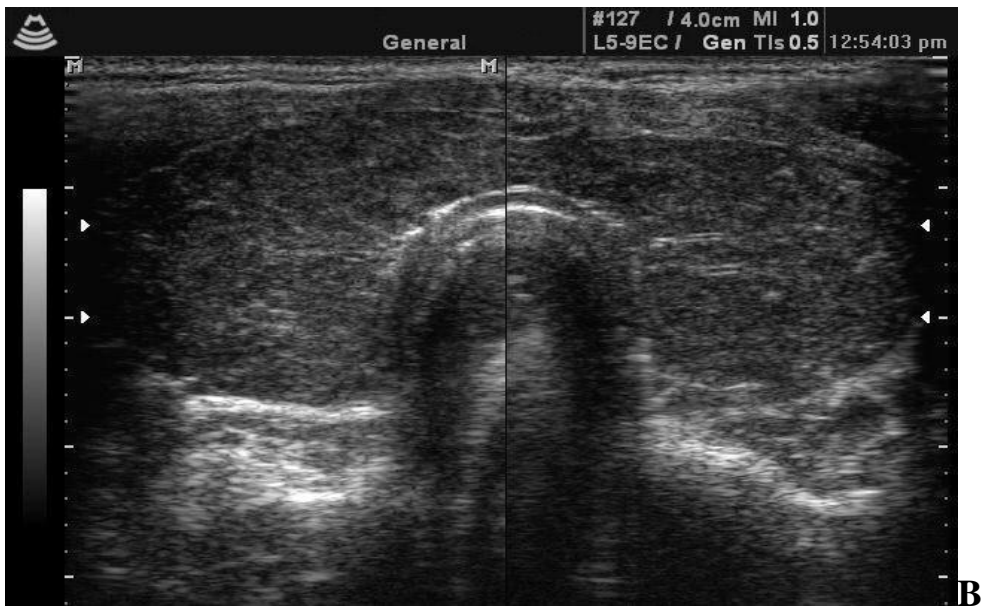
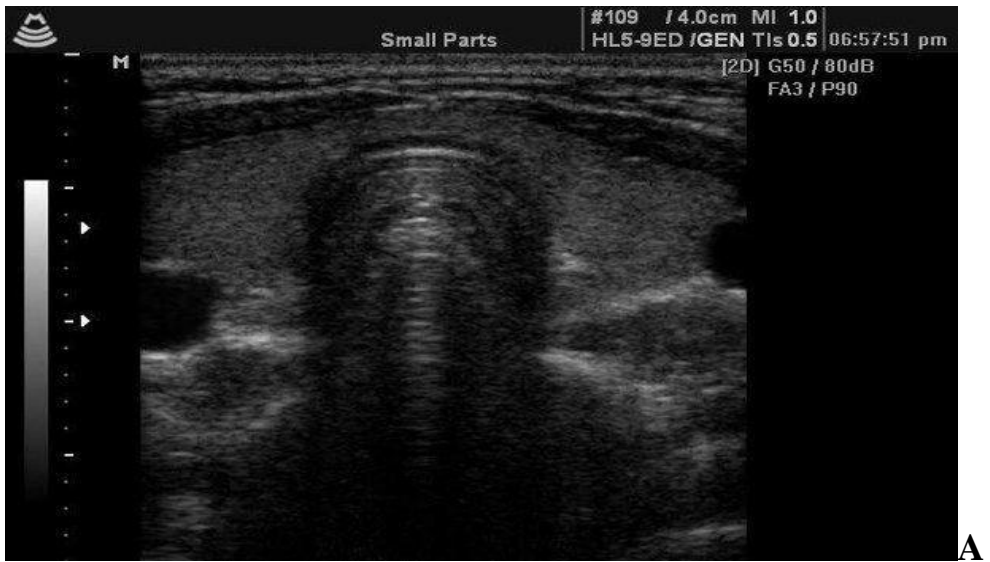




Fig 11. Ultrasound picture of various diseases of the thyroid gland: A - normal structure of the thyroid gland; B - chronic thyroiditis, C- thyroid cyst ; D- a node of the thyroid gland (sonographic atlas of ultrasound images (for doctors) 2017).).

Table 6 below shows structural changes in the thyroid gland:

Table 6

Structural changes of the thyroid gland under ultrasound diagnostics

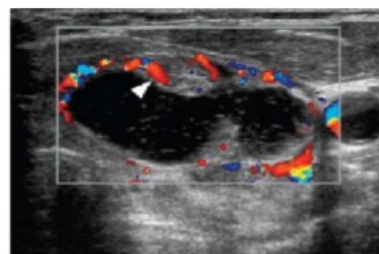
Thyroid nodule

Composition / Predominantly cystic nodule

Transverse US of left lobe



Corresponding color Doppler US



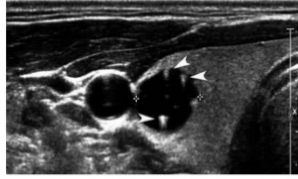
Predominantly cystic nodule with small solid mural component
 Flow within mural component (arrowheads): tissue and not debris
 US-guided FNA directed into this area: benign lesion

Thyroid nodule

Composition / Colloid cyst

53-year-old male with incidental mass in right lobe seen on CT

Transverse ultrasound of right lobe

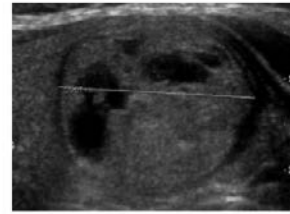


Cystic mass with large **ring down artifact** (arrowheads) consistent with benign colloid cyst

Dighe M et al. Med Ultrason 2017;19(2):195–210.

Thyroid nodule

Composition / Predominantly solid nodule

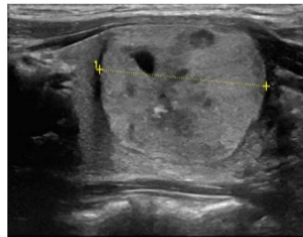


Iso- to hyperechoic thyroid nodule containing multiple cystic components

Gattini D et al. Thyroid Ultrasound. In: EFSUMB – European Course Book – Editor: Dietrich CF – 2011

Thyroid nodule

Echogenicity / Hyperechoic nodule



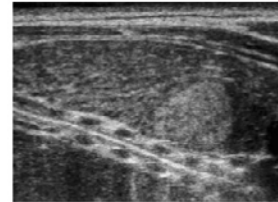
Almost completely solid and hyperechoic nodule
Some small cystic components
Smooth margin – No calcifications

Head and neck ultrasonography: essential and extended applications. Second edition, 2017. Editor: LA Orloff – Plural Publishing Incorporation, San Diego, CA, USA.

Hashimoto's thyroiditis

white-knight nodule

16-year-old boy with known Hashimoto thyroiditis



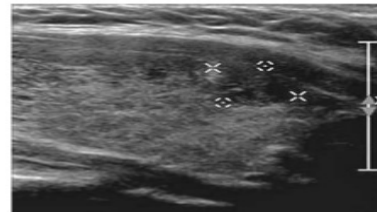
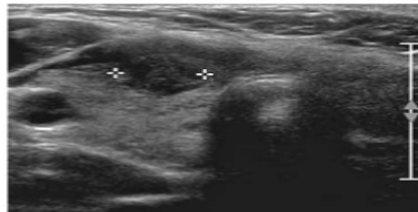
Background thyroid: hypoechoic with micro-nodularity features typical of diffuse Hashimoto thyroiditis
Well-defined homogenous hyperechoic nodule known as **white-knight**
Surgical removal demonstrated nodular Hashimoto thyroiditis

Henrichsen TL et al. Radiol Clin N Am 2011;49:417–424.

Papillary thyroid carcinoma

Patient with long-standing Hashimoto's thyroiditis

Transverse and sagittal US of right thyroid lobe



Subtle hypoechoic nodule proved to be papillary thyroid carcinoma
Nodule easily blends in to adjacent hypoechoic thyroid on sagittal view
Multiple tiny hypoechoic nodules consistent with Hashimoto thyroiditis

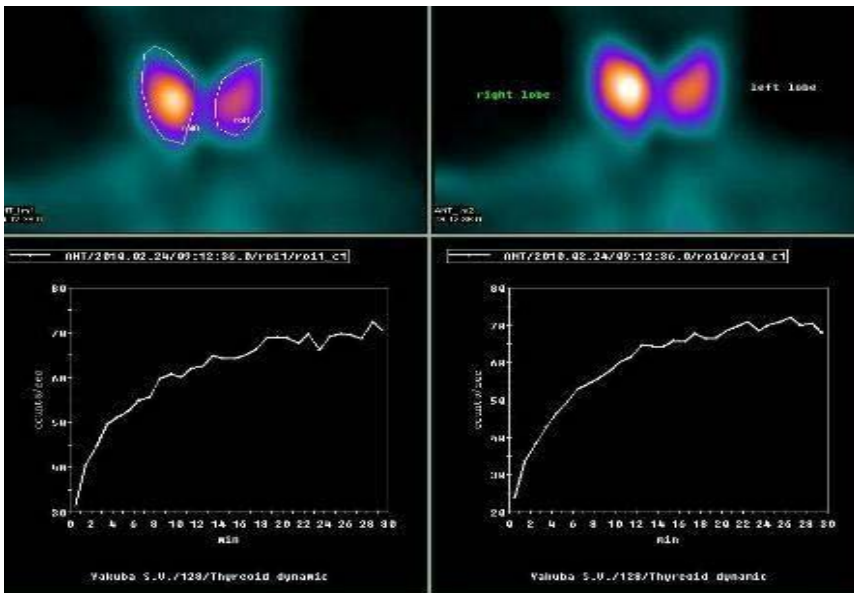
Sholosh B et al. Radiol Clin N Am 2011;49:391–416.

X-ray examination. X-rays of the neck and chest organs can diagnose the symptoms of compression or displacement of the trachea and esophagus in retrosternal goiter, confirm or exclude the presence of lung metastases

Computed tomography (CT) is a method that combines the advantages of ultrasound and x-rays. It is used less often than others because of the high cost of the equipment and the procedure itself.

Scintigraphy. The main advantage of scintigraphy is the ability to evaluate the functional activity of various tissue sites of the thyroid gland. The method based on the principle of uneven accumulation of isotopes in functioning and non-functioning parts of the thyroid gland. By the nature of the accumulation of radiopharmaceuticals distinguish "hot", "warm" and "cold" types of nodes. A "hot" or autonomously functioning node is diagnosed when it accumulates a radiopharmaceutical more than a normal tissue. "Warm" nodes have the same level of accumulation of the isotope as the surrounding tissue. Such nodes have a normal or moderately elevated function. "Cold" nodes are defined as a defect in the accumulation of an isotope. As a rule, they have decreased activity. Radioisotope scanning is the most sensitive method for diagnosis of a retrosternal goiter, anomalies of thyroid gland development and highly differentiated carcinoma metastases. The choice of an isotope depends on several factors. The most common and used isotope is pertechnetate which have a short half-life period (6 hours), which, like iodine, actively accumulates in the thyroid gland, but unlike it, can not be organized and gives an opportunity to evaluate the dynamics of blood flow through the gland and the rate of accumulation of the isotope. However, they do not allow the use of the drug to detect the retrosternal goiter, anomalies of the development of the thyroid gland and cancer metastases. For this purpose, iodine isotopes are used. At present, ^{131}I is used very rarely due to the relatively large radiation load and only for the detection of thyroid cancer metastases.

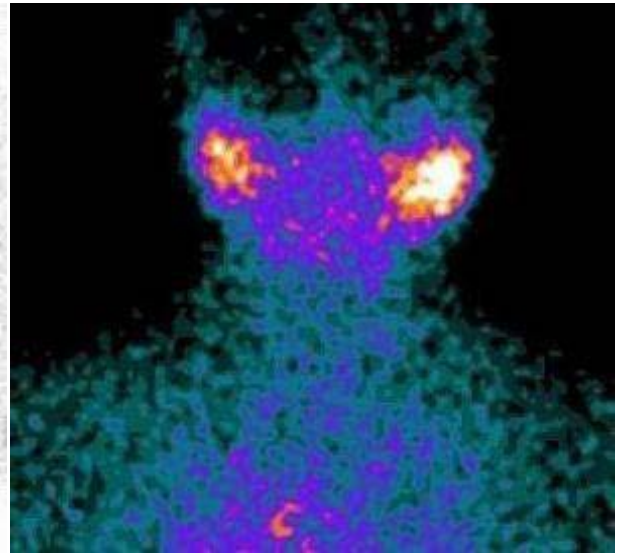
Picture 12 below depict scangrams of accumulation of radiopharmaceuticals during scans and scangrams of various diseases of the thyroid gland.



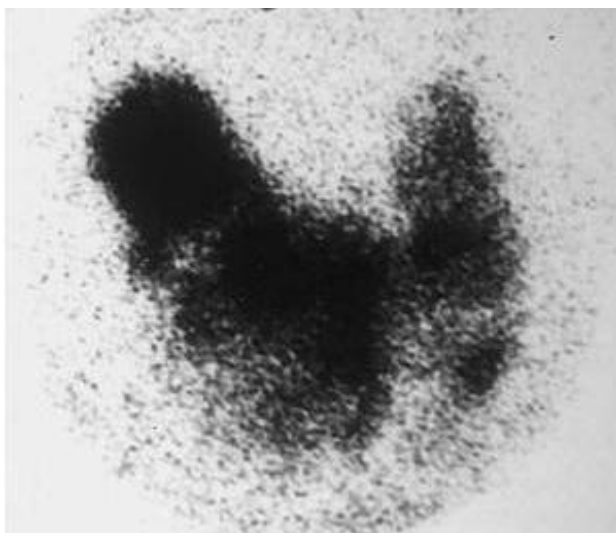
A



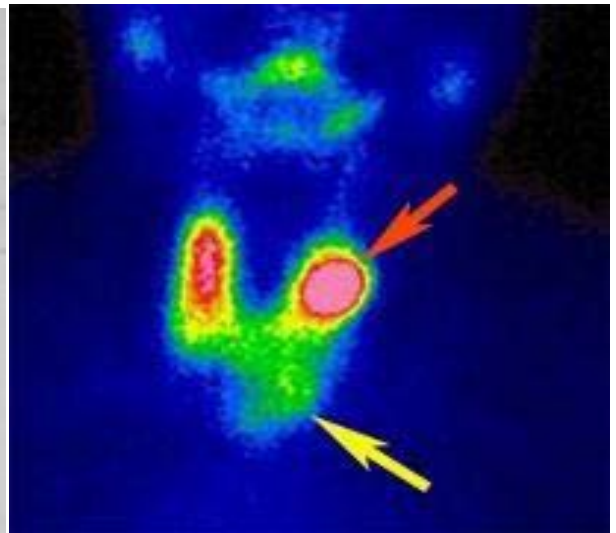
B



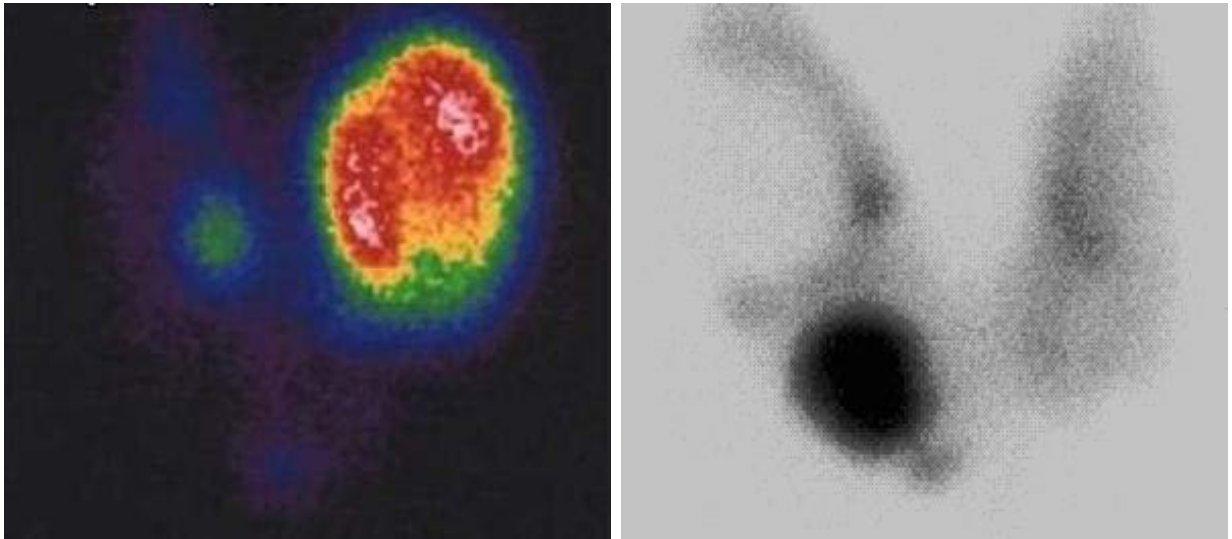
C



D



E



G

F

Fig 12. Scangrams of various diseases of the thyroid gland: A - accumulation of radiopharmaceutical during scanning; B - diffuse toxic goiter; C - chronic thyroiditis; D - multinodular goiter; E - retrosternal goiter; F – «hot» nodes; G – «cold» nodes (<https://ua.radiolog.kiev.ua/>).

Magnetic resonance imaging (MRI) allows us to obtain an image of thyroid without radiation and contrast substances, but it's informativeness is comparable to ultrasound's and is not the main method of diagnosis. It is mainly prescribed for localisation behind sternum. In addition, MRI is used to diagnose and evaluate the efficacy of endocrine ophthalmopathy treatment.

Biopsy. Fine needle aspiration biopsy has a leading role in the morphological diagnosis of thyroid gland diseases. The procedure has no serious complications. Only isolated cases of hematoma are noted and single observation of the tracheal puncture is described. For performing a puncture of the thyroid gland anesthesia is not needed. Fig.13 depicts the principle of fine needle aspiration biopsy. [11].



Fig.13. Principle of fine-needle aspiration biopsy.

A standardized scale for assessing changes in the thyroid gland (ACR TIRADS scale), recommendations for performing a fine needle aspiration biopsy (FNAB) and repeated studies were developed in 2017. The TIRADS classification, developed by the American College of Radiology (ACR), is used to further define the tactics of treating patients with nodal changes in the thyroid gland [8].

According to the results of the FNAB of the thyroid gland, the cytological conclusion can be as follows [8]:

- ✓ TIRADS 1 – normal thyroid gland.
- ✓ TIRADS 2 – benign changes in the thyroid gland.
- ✓ TIRADS 3 – probably benign changes in the thyroid gland.
- ✓ TIRADS 4 – suspected of malignant changes in the thyroid gland. This group is classified in 4a, 4b, 4c, depending on the increased risk of malignancy.
- ✓ TIRADS 5 – most likely malignant changes in the thyroid gland (more than 80% probability of malignancy)
- ✓ TIRADS 6 – the previous biopsy proved malignancy.

Laryngoscopy. Conducted mainly before the operation to remove the cancer of the thyroid gland. This method helps to reduce the probability of complications for vocal cords after surgery.

Thyroid disease syndromes.

Thyrotoxicosis is a syndrome due to the prolonged increase in T4 and T3 in blood and tissues with characteristic clinical manifestations [3,13,14,15].

Syndrome of thyrotoxicosis has such clinical manifestations as:

Changes in the cardiovascular system: cardiac rhythm disturbance (sinus tachycardia, extrasystoles, atrial fibrillation); arterial hypertension; high pulse pressure; circulatory failure due to myocardial dystrophy.

Table 7

Changes in the peripheral nervous system.

Symptoms	Clinical manifestations
Marie`s sign	fingers trembling
Sign of a Telegraph Pillar	tremor of the head, lips, tongue, hands, whole body
Sign of saucer	Tremble empty cup on saucer in hand
Geoffroy`s sign	central paresis of facial muscles - the absence of wrinkles on the forehead when looking up.

Changes in the central nervous system.: trembling of the body, emotional lability, sleep disorder; increased sweating, persistent red dermographism; increase of tendon reflexes.

Changes from the gastrointestinal tract: frequent duning; liver disfunction to the development of hepatitis.

Endocrinopathy due to hyperproduction of thyroid hormones: insufficiency of the adrenal glands; disturbance of carbohydrate metabolism from carbohydrates tolerance to development of diabetes mellitus; menstrual cycle disorder, miscarriage, laceration of the mammary glands; gynecomastia in men.

Syndrome of catabolic disorders: muscle weakness; subfebrile body temperature; weight loss with increased appetite; osteoporosis.

Syndrome of ectodermal disorders: brittleness of hair and hair loss; Plummer`s Nail - high brittleness of nails and fluttering, pretibial myxedema, dermatopathy, vitiligo (Fig 14)



Fig.14. Pretibial myxedema, dermatopathy, vitiligo (Martyniuk L.P.2013).

Table 8

Eye symptoms of thyrotoxicosis

Symptoms	Clinical manifestations
Dalrymple`s sign	wide opening of the palpebral fissure, surprised, frightened eyes
Ellinek`s sign	eyelid skin pigmentation
Stilevag`s sign	not frequent and incomplete blinking
Krause`s sign	intensified eye shine
Zinger`s sign	swelling of the eyelids
Bram`s sign	during laughter there is no narrowing of the palpebral fissure
Rosenbach`s sign	small and quick trembling of the lowered eyelids
Mebius`es sign	when fixing the look on a close object, the eyes cannot be in the position of convergence for a long time
Graefe`s sign	is the lagging of the upper eyelid on downward rotation of the eye
Popov`s sign	upper eyelid drops abruptly
Senton`s sign	the upper eyelid first rises through the spastic contraction of the muscles of the forehead
Kocher's sign	In fixation on a fast upwards movement there occurs a convulsive retraction of the eyelid.

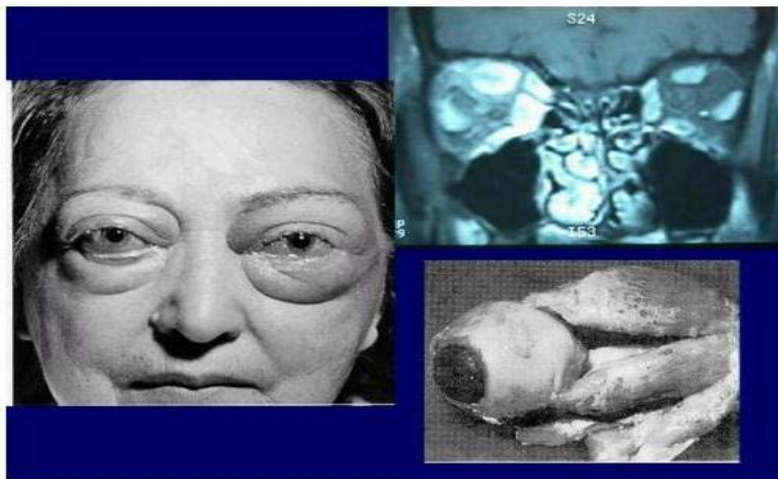


Fig.15. Eye symptoms of thyrotoxicosis (Martyniuk L.P.2013).

Hypothyroidism syndrome

Hypothyroidism is a clinical syndrome caused by prolonged, persistent lack of thyroid hormones in the body or a decrease in their biological effect at the tissue level [13,18,19].

- Common symptoms: weight gain, general weakness, fatigue and reduced ability to work, drowsiness, feeling cold.
- Skin lesions: skin is dry, with a yellowish tinge, hyperkeratosis of the epidermis, for example, on the elbows. Subcutaneous edema, dry and brittle hair, sometimes loss of eyebrows.
- Changes in the circulatory system: bradycardia, muted tones of the heart; low blood pressure, rarely - hypertension.
- Changes in the respiratory system: a hoarse, deaf voice and a decrease in the depth and frequency of breathing.
- Changes in the digestive system: chronic constipation.

- Changes in the nervous system: paresthesia, weakness of reflexes, sometimes hearing loss.
- Changes in the reproductive system: in women - a violation of the menstrual cycle (shortening the duration of the cycle, abundant menstruation), infertility, miscarriage; in men - decreased libido and sometimes erectile dysfunction
- Mental disorders: decreased ability to concentrate, memory impairment, depression.

Classification of diseases of the thyroid gland (International classification of diseases of the tenth revision) (ICD-10) [14].

(E00) Congenital iodine-deficiency syndrome

- (E00.0) Congenital iodine-deficiency syndrome, neurological type
- (E00.1) Congenital iodine-deficiency syndrome, myxedematous type
- (E00.2) Congenital iodine-deficiency syndrome, mixed type
- (E00.9) Congenital iodine-deficiency syndrome, unspecified

(E01) Iodine-deficiency related thyroid disorders and allied conditions

- (E01.0) Iodine-deficiency related diffuse (endemic) goiter
- (E01.1) Iodine-deficiency related multinodular (endemic) goiter
- (E01.2) Iodine-deficiency related (endemic) goiter, unspecified
- (E01.8) Other iodine deficiency related thyroid disorders and allied conditions

(E02) Subclinical iodine-deficiency hypothyroidism

(E03) Other hypothyroidism

- (E03.0) Congenital hypothyroidism with diffuse goiter
- (E03.1) Congenital hypothyroidism without goiter
- (E03.2) Hypothyroidism due to medicaments and other exogenous substances
- (E03.3) Postinfectious hypothyroidism
- (E03.4) Atrophy of thyroid (acquired)
- (E03.5) Myxedema coma
- (E03.8) Other specified hypothyroidism
- (E03.9) Hypothyroidism, unspecified

(E04) Other nontoxic goiter

(E04.0) Nontoxic diffuse goiter

(E04.1) Nontoxic single thyroid nodule

(E04.2) Nontoxic multinodular goiter

(E04.8) Other specified nontoxic goiter

(E04.9) Nontoxic goiter, unspecified

(E05) Thyrotoxicosis [hyperthyroidism]

(E05.0) Thyrotoxicosis with diffuse goiter

(E05.1) Thyrotoxicosis with toxic single thyroid nodule

(E05.2) Thyrotoxicosis with toxic multinodular goiter

(E05.3) Thyrotoxicosis from ectopic thyroid tissue

(E05.4) Thyrotoxicosis factitia

(E05.8) Other thyrotoxicosis

(E05.9) Thyrotoxicosis, unspecified

(E06) Thyroiditis

(E06.0) Acute thyroiditis

(E06.1) Subacute thyroiditis

(E06.2) Chronic thyroiditis with transient thyrotoxicosis

(E06.3) Autoimmune thyroiditis

(E06.4) Drug-induced thyroiditis

(E06.5) Other chronic thyroiditis

(E06.9) Thyroiditis, unspecified

(E07) Other disorders of thyroid

(E07.0) Hypersecretion of calcitonin

(E07.1) Dyshormogenetic goiter

(E07.8) Other specified disorders of thyroid

(E07.9) Disorder of thyroid, unspecified

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3. <https://www.medison /ultrasound/>
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Electronic resources:

1. Trending Thyroid Topics. URL :
<https://www.medicinenet.com/thyroid/focus.htm2>.
2. Thyroid. URL : <https://www.hormone.org/your-health-and-hormones/glands-and-hormones-a-to-z/glands/thyroid>
3. Thyroid Problems. URL:
https://www.emedicinehealth.com/thyroid_problems/article_em.htm

6. Task and materials for self-study:

Test tasks of the previous level of knowledge of students

1. The characteristic features of hyperthyroidism include the following, except:
A. Growth of body weight
B. Hot skin
C. Emotional imbalance
D. Tachycardia
E. Exophthalm
2. What condition is a contraindication to surgical treatment?
A. Thyroid adenoma
B. Nodule nontoxic goiter
C. Toxic goiter in pregnant women
D. Diffuse toxic goiter in the stage of decompensation
E. Diffuse toxic goiter in the stage of compensation
3. Determine the most informative laboratory indicator for the diagnosis of primary hypothyroidism:
A. TSH
B. Total thyroxine
C. Free thyroxine
D. Triiodothyronine
E. Level of antibodies to thyroperoxidase
4. What is the most common cause of subacute granulomatous thyroiditis?
A. Pregnancy
B. Immune dysfunction
C. Injury
D. Viral infection

E. Lack of iodine

5. A patient with a diagnosis of "chronic autoimmune thyroiditis" has a risk of developing:

A. Dysmenorrhea.

B. Dislipidemia.

C. Hypothyroidism.

D. Galactorrhea.

E. Dysbacteriosis.

Test tasks of the final level of students' knowledge

1. Patient K, 52, complains of weight gain, weakness, constipation, memory impairment. The indicated symptoms slowly increased during the last 1.5 years. Objectively: dry skin, moderate swelling of the face and extremities, heart borders enlarged, tones muted, pulse - 66 / min., AT -110/70 mm Hg, thyroid gland is not palpable. The detected antibodies to the thyroglobulin (+) and the microsomal antigen (+++); The level of thyrotropic hormone is 15.2 μ IU/L. Ultrasound of the thyroid gland: a gland of reduced size, heterogeneous structure. A. Diffuse nontoxic goiter.

B. Autoimmune thyroiditis without thyroid dysfunction.

C. Endemic goiter.

D. Subacute thyroiditis.

E. Autoimmune thyroiditis, hypothyroidism.

2. A 25-year-old woman during a prophylactic examination revealed an increase in thyroid gland. He is constantly lives in the Lviv region. The pathology of the internal organs was not detected during further examination. Thyroid gland is diffusely enlarged to., grade 2, soft-elastic, smooth, with no pain. The level of

thyroid hormones within the normal range. Ultrasound: thyroid gland enlarged, echogenicity unchanged. Indicate the most likely diagnosis:

- A. Nontoxic diffuse euthyroid goiter grade 2**
- B. Autoimmune thyroiditis without thyroid dysfunction.
- C. Endemic diffuse euthyroid goiter grade 2
- D. Nodular goiter.
- E. Chronic thyroiditis.

3. A 40-year-old female at a thyroid gland examination in the left lobe revealed a node, palpation-condensed, moderately painful during palpation, and "cold" at scintigraphy. What screening is most appropriate to clarify the diagnosis?

- A. Fine needle aspiration biopsy.**
- B. Determination of the level of TSH in the blood.
- C. Reflexometry.
- D. Determination of urinary iodine excretion.
- E. Thermography of the thyroid gland.

4. A woman 36 years old takes a daily dose of 50 µg of L-thyroxine due to primary hypothyroidism. What screening is appropriate for assessing the dose effectiveness of the drug?

- A. Determination of thyroxine level**
- B. Determination of the level of triiodothyronine
- C. Determination of TSH level
- D. Determination of thyroglobulin level
- E. Determination of cholesterol level

5. The patient is 32 years old, the thyroid gland is diffusely enlarged to grade 3, clinical manifestations of thyrotoxicosis are absent. Ultrasound: Thyroid gland is inhomogeneous, in both parts visualized hypoechogenic structures with sizes from

1x1 to 4x4 mm; lymph nodes are not enlarged. What therapeutic tactic is appropriate?

A. Monitoring and control after 6 months

B. Purpose of Thiamzole and control after 3 months

C. Subtotal resection of the thyroid gland

D. Total thyroidectomy

D. Purpose of thyroid hormones and control after 3 months

6. The patient has an asymmetric increase in the thyroid gland of the grade 3. The gland is painful during palpation, the pain is irradiated in the lower jaw. Body temperature - 38 ° C. A week ago there was tonsillitis. In the general analysis of blood - accelerated ESR. Most likely, the patient:

A. Fibrous thyroiditis

B. Diffuse toxic goiter

C. Toxic adenoma of the thyroid gland

D. Autoimmune thyroiditis

E. Subacute thyroiditis

7. The endocrinology department has hospitalized a patient with suspected cancer of the thyroid gland. When objective examination is determined symmetrically enlarged thyroid gland, compacted, conjugate with adjacent tissues, peripheral lymph nodes are not enlarged, clinically detected symptoms of hypothyroidism, the titre of anti-thyroid antibodies does not exaggerate the norm. In the material obtained during a puncture biopsy, cellular atypia is not detected, fibroblasts are determined. What diagnosis do you have for this patient?

A. Hashimoto's thyroiditis

B. De Quervain's Thyroiditis

C. Riedel's thyroiditis

D. Thyroid cancer

8. In a patient who has suffered from otitis, body temperature rises, pulsating pain in the neck with irradiation in the upper and lower jaw, sweating, palpitations appeared. At palpation of the thyroid gland a sharp pain is noted and the area of fluctuation is determined. In the clinical analysis of blood leukocytosis up to 13 000 with the shift of the leukocyte formula to the left, acceleration of ESR to 25 mm / h. What diagnosis do you have for the patient?

- A. Subacute thyroiditis
- B. Thyrotoxicosis
- C. Acute thyroiditis**
- D. Autoimmune thyroiditis
- E. Diffuse toxic goiter

9. The patient has diffuse toxic goiter. Receives Thymazole at a dose of 50 mg per day. After 3 weeks of treatment, the temperature of the body increased to 38.1 ° C, there was a sore throat, painful ulcers in the mouth. General blood test: Er - $3,1 \times 10^{12} / l$; Hb- 94 g / l; CI- 1,0; L - $1,0 \times 10^9 / l$; ESR-28 mm / h What is the reason for this?

- A. Development of agranulocytosis.**
- B. Development of peritonsillar abscess.
- C. Acute respiratory infection.
- D. Development of thyrotoxic crisis.
- E. Allergic reaction

10. A woman 47 years old has been complaining about weakness, sweating, trembling in the body, weight loss, palpitations, enlargement of the neck, tearfulness, photophobia. Objectively: thyroid gland is diffusely enlarged, elastic, moving, painless. Heart rate - 128 / min, atrial fibrillation. Which of the symptoms most likely will assess the severity of thyrotoxicosis?

- A. The presence of arrhythmia**
- B. Sizes of the thyroid gland

C. Condition of the eyeballs

D. Height and weight

E. Blood pressure

11. In a woman 52 years after thyroidectomy appeared is inspiratory dyspnea, compression pain in the chest, paresthesia in the area of the face and limbs. What symptom is most likely to appear?

A. Stellwag'S sign

B. Babinski sign

C. Chvostek's sign

D. Mobius sign

E. Graefe`s sign

12. The patient is 48 years old, complains about irritability, sweating, tremor of hands, palpitations, weight loss, progressive weakness, sleep disturbance. He felt ill one year ago. Objectively: the skin is moist, heat, thyroid gland is diffusely enlarged to 2 grade, elastic consistency. Pulse - 118 / min, BP- 150/60 mm Hg. Heart tones strengthened, systolic noise above the apex of heart. Preliminary diagnosis:

A. Chronic autoimmune thyroiditis

B. Diffuse goiter grade 3, thyrotoxicosis

C. Diffise goiter grade 3, euthyroidism

D. Diffise goiter grade 3, vegetative vascular dystonia

E. Diffise goiter grade 3, climacteric syndrome

13. A woman of 25 years old, has a diffuse toxic goiter for 5 years. She is emotionally labile, there is a tremor of the fingers, the skin is moist, warm, the borders of the heart are shifted to the left, atrial fibrillation, systolic murmur at the apex. Pulse - 96 / min., BP- 170/70 mm Hg. The thyroid gland is enlarged to grade 3. What pathogenetic mechanisms underlie the dysfunction of the cardiovascular system?

A. Increased sensitivity of receptors to catecholamines

B. The damaging effect of thyroid hormones on the myocardium

C. Increased catabolism of protein substrates

D. Influence of thyroid stimulating antibodies

E. Change of the autonomic nervous system (n.vagus)

14. Patient P., 32 years old, complains of constant irritability, palpitations, eye pain, tearfulness, weight loss 10 kg in 4 months. Objectively: the skin is warm, moist, mild exophthalmos, Graefe`s, Kocher`s, Mobius`s signs. The thyroid gland is diffusely enlarged, seen when swallowing, painless. Pulse - 108 / min., Blood pressure - 140/66 mm Hg. Tremor of fingers. Your diagnosis?

A. Acute thyroiditis

B. Nodular toxic goiter

C. Diffuse toxic goiter

D. Neurasthenia

E. Subacute thyroiditis

15. With diffuse toxic goiter increase:

A. Antibodies to the microsomal fraction

B. Antibody to the thyroglobulin

C. Thyroid-stimulating antibodies

16. For differential diagnosis of Graves' disease and iodine-induced hyperthyroidism in a patient who receives amiodarone it is necessary to conduct:

A. Hormonal examination

B. Ultrasound examination

C. Radioisotope examination of thyroid gland

D. Testing of blood for the presence of thyrostimulating antibodies

17. A 30-year-old man has a node in the thyroid gland. The patient's father died of thyroid cancer. In the blood: calcitonin 2000 pg / ml (N <100); serum calcium and phosphorus within normal limits. What diagnostic examination is needed before a patient is referred to a surgeon?

A. Determination of the concentration of catecholamines in urine

B. Scanning of the liver

C. Calcium infusion test

D. Determination of the concentration of TSH against the background of a suppressive dose of thyroxine

E. Diagnostic course of treatment with radioactive iodine

18. In the cardiology department, a patient was hospitalized with complaints about aching chest pain, mild shortness of breath, leg edema, and chilliness. On ECG: negative T wave in V2 - V6 (up to 34 mm). Objectively: the skin is dry, the voice is hoarse, the face is puffy, jaundiced, the heart sounds are deaf, the pulse is 60 / min, the blood pressure is 160/90 mm Hg, the lower extremities are swollen; In the blood: Hb- 76 g / l, ESR-17 mm / hour. What is the most likely diagnosis?

A. Hypothyroidism, myocardial dystrophy

B. Chronic glomerulonephritis, chronic renal failure

C. Coronary heart disease, chronic heart failure

D. Hypertensive disease, chronic heart failure

E. B12-deficiency anemia

19. A 39-year-old patient complains about a tumor on the anterior surface of the neck. Ill 2 years ago. The tumor has increased in size, the timbre of the voice has changed, a feeling of pressure has appeared. Objectively: in the left lobe of the thyroid gland a node 3 cm in diameter is palpated, of increased density, painless. Enlarged lymph nodes of the neck. The functional state of the thyroid gland is not changed. What is the most likely diagnosis?

A. Thyroid cancer

- B. Nodular goiter (euthyroidism)
- A. Nodular goiter (hyperthyroidism)
- C. Hashimoto's thyroiditis
- E. Riedel's thyroiditis

20. A 12-year-old child during a routine examination revealed a diffuse enlargement of the thyroid gland of the grade 2. Auscultation of the heart revealed a muted heart tone, HR-64 / min. It has a tendency to constipation. Anemia has been identified. Increased levels of antibodies to thyroglobulin. What is the likely cause of these symptoms?

A. Autoimmune thyroiditis

- B. Diffuse toxic goiter
- C. Thyroid cancer
- D. Hyperplasia of the thyroid gland
- E. Endemic goiter

21. A 14-year-old girl about a year ago developed irritability and tearfulness. At the same time, the thyroid gland of the grade 2 was determined diffusely. The condition was regarded as a manifestation of puberty, treatment was not carried out. Irritability gradually changed with complete apathy. Face puffiness, soft tissue pasty, bradycardia, constipation appeared. The paleness of the skin. Gland has become denser. What disease should be assumed?

A. Autoimmune thyroiditis

- B. Diffuse toxic goiter
- C. Thyroid cancer
- D. Subacute thyroiditis
- E. Juvenile basophilism

22. A 49-year-old patient is operating on for thyroid cancer. The extent of the process - T₃N_aM₀, morphologically - papillary carcinoma. What should be the volume of radical surgery?

A. Thyroidectomy

- B. Subtotal resection of the gland
- C. Resection of the affected particle
- D. Tumor enucleation
- E. Resection of the affected particle with the isthmus

23. A 47-year-old woman had resection of the thyroid gland for a nodular euthyroid goiter. What treatment is most likely to help avoid recurrence of the disease?

A. Thyroid hormones

- B. Thimazole
- C. Thyrotropin
- D. Potassium iodide
- E. Radioactive iodine

24. A 73-year-old patient complains about weakness, drowsiness, chilliness, severe memory impairment, hair loss, constipation, and swelling. Objectively: the skin is dry, yellowish. Swelling of the face, extremities (after pressing on the skin of the leg, the fossa does not remain). Heart borders expanded, muted tones, bradycardia. The thyroid gland is reduced in size. In the blood: Hb-85 g / l, cholesterol - 8.5 mmol / l; TSH - 20.5 μ mol / L. What is the diagnosis?

A. Hypothyroidism

- B. Cardiosclerosis
- C. Chronic hepatitis
- D. Renal insufficiency
- E. Cerebrovascular atherosclerosis

25. A 32-year-old patient marks a tumor-like formation on the front surface of the neck, which appeared two years ago. The last three months, the tumor has rapidly increased, there were disturbances of swallowing and talking, feeling of pressure

by the tumor. Objectively: the skin is of normal humidity, the pulse is 80 / min., rhythmic, the blood pressure is 130/80 mm Hg. In the right lobe of the thyroid gland is defined node 3.0 x3.5 cm, dense, hilly, which is displaced when swallowing. On the scan in the thyroid gland - "cold node". What is the diagnosis?

A. Thyroid cancer

B. Adenoma of the thyroid gland

C. Cyst thyroid gland

D. Nodular goiter

E. Autoimmune thyroiditis

26. A 57-year-old man notes heartbeat, sweating, sleep disturbance, increasing weakness, and weight loss. He was treated about coronary artery disease without effect. Objectively: temperature 36.8, heart rate 128 / min., Pulse 112 / min., arrhythmic, blood pressure 160/70 mm Hg. The skin is warm, moist. Tremor of fingers Heart sounds are enhanced, systolic murmur above the top. The thyroid gland is not palpable. Which of the following studies is the most important to clarify the diagnosis?

A. Investigation of the level of thyroid hormones in the blood

B. Lipid blood spectrum

C. Test with dosed physical load

D. Ultrasound examination of the thyroid gland

E. Ultrasound examination of the heart

27. A 14-year-old girl complains of a feeling of constriction in the neck, coughing, thickening of the neck. Objectively: the thyroid gland is diffusely enlarged, dense on palpation, painless, the surface is smooth. When ultrasound - thyroid tissue is heterogeneous. Preliminary diagnosis: autoimmune thyroiditis. To confirm the diagnosis should be determined in the blood plasma:

A. The titre of antibodies to thyroglobulin

B. Level of calcitonin

- C. Level of somatostatin
- D. Level of parathyroid hormone
- E. Level of iodine in the daily urine

28. A 19-year-old patient has a nodular goiter. There are no clinical signs of changes in thyroid function. Puncture biopsy revealed papillary adenocarcinoma. What data will most likely be present in the patient's medical history?

- A. Living in an area with iodine deficiency
- B. Effect of radioactive isotopes of iodine**
- C. Hereditary factors
- D. The presence of autoimmune thyroiditis
- E. Presence of nerve strain

29. A 25-year-old woman has a node in the right lobe of the thyroid gland discovered during the physical examination. On the scan - "hot" node. The level of T3 in the blood plasma is increased, the level of thyroid-stimulating hormone is reduced. ECG changes are most likely?

- A. Increase the R-R interval
- B. Voltage reduction
- C. Sinus tachycardia**
- D. Conductivity disorder
- E. Ventricular extrasystole

30. A woman 36 years old, takes a daily dose of 50 μg of L-thyroxine due to primary hypothyroidism. What screening is appropriate for assessing the dose effectiveness of the drug?

- A. Determination of thyroxine level
- B. Determination of the level of triiodothyronine
- C. Determination of TSH level**
- D. Determination of thyroglobulin level

E. Determination of cholesterol level

31. A 38-year-old woman with an objective examination revealed dry skin, pubic and axillary hair loss, overweight and pasty face. The thyroid gland palpates the isthmus, painless, mobile. Pulse - 56 / min., Rhythmic. BP - 100/60 mm Hg. Tendon reflexes are slow. Which of the following drugs should be prescribed?

- A. Estrogens
- B. Cardiac drugs
- C. Cholesterol-lowering agents
- D. Preparations which containing iron

E. Hormones of the thyroid gland

32. A man, 62 years old, complains of palpitations, interruptions in the work of the heart in the last six months. Treatment at the cardiologist did not bring any effect. Objectively: BP - 160/80 mm Hg., Pulse - 120 / min., arrhythmic. Thyroid gland, grade 2, elastic consistency, mobile, painless. ECG - atrial fibrillation, tachysystolic form. What blood counts need to be determined?

- A. Antibody to microsomal fraction

B. Triiodothyronine and TSH

- C. Tireoglobulin
- D. Antibody to thyroglobulin
- E. Calcitonin

33. A 50-year-old man went to the hospital about the appearance of a tumor-like formation on the right side of the neck, which appeared 1 month ago. Objectively: the thyroid gland enlarged, grade 2. In the right lobe a dense area with a diameter of about 1.5 cm is palpated. On the back surface of the m.sternocleidomastoideus enlarged lymph node is palpated. What research is needed to verify the diagnosis?

A. Fine needle aspiration

- B. Ultrasound examination of the thyroid gland

- C. Thermography of the thyroid gland.
- D. Scintigraphy of the thyroid gland
- E. Determination of the level of thyroid hormones in the blood plasma

34. A 48-year-old woman with clinical symptoms of thyrotoxicosis has a painless goiter of minor size, ophthalmopathy is absent. The results of the survey: T3-245ng / dl (normal 90-200), T4-16,2 ng / dl (normal 4.5-12), TSH-1 μ mol / ml (normal 0.5-3.6), thyroglobulin -25 ng / dl (normal 2-20), ESR - 10 mm / h.

Probable diagnosis:

- A. Iodine-induced thyrotoxicosis;
- B. Hyperthyroidism;**
- C. Painless form of thyroiditis.
- D. Subacute thyroiditis

35. A 27-year-old woman with a 21-week pregnancy has autoimmune thyroiditis. The patient has no complaints, thyroid gland is dense, elastic, homogeneous. In blood, normal levels of T3 and T4, an increase in TSH to 12 μ M / ml (norm 0.4-4.0) are determined. According to the ultrasound, the thyroid gland volume is 23 ml. What is your tactic for driving this patient?

- A. Recommend the use of products with increased iodine content.
- B. Observance, prescribe L-thyroxine only when T3 and T4 are reduced.
- C. To prescribe 25 mg of L-thyroxine**

36. Which of the following complications can be seen in a child if the mother is afflicted with DTG?

- A. Autoimmune thyroiditis
- B. Newborn thyrotoxicosis.**
- C. Jaundice of newborns.

37. An increase of the level of thyrotoxin-binding globulin and serum thyroxine occurs due to:

A. Estrogens

B. Phenytoin

C. Salicylates

D. All of the above

E. None of the above

38. The placental barrier is very permeable for:

A. Iodine

B. Thyroid stimulating antibodies

C. Thyrostatic drugs

D. Thyroid hormones

39. A 32-year-old patient has one-sided exophthalmos, goiter and increased nervousness. All indicators of the tests performed are normal: T4 9.6 ng/dl (norm 6-12), TSH at the lower limit of norm, but increases when working with thyroliberin. Your diagnosis?

A. Euthyroid ophthalmopathy

B. Ophthalmopathy of unknown etiology

C. Autoimmune thyroiditis

D. T3-thyrotoxicosis

40. Mechanism of increasing thyroid gland during pregnancy:

A. Increasing the need for iodine

B. Increased production of thyroxine-binding globulin in the liver

C. Increased production of chorionic gonadotropin in 1 trimester of pregnancy

41. A 27-year-old woman with a 21-week pregnancy has autoimmune thyroiditis. The patient has no complaints, thyroid gland is dense, elastic, homogeneous. In blood, normal levels of T3 and T4, an increase in TSH to 12 $\mu\text{M} / \text{ml}$ (norm 0.4-

4.0) are determined. According to the ultrasound, the thyroid gland volume is 23 ml. What is your tactic for managing this patient?

- A. To prescribe L-thyroxine**
- B. To prescribe drugs which containing iodine
- C. Abort pregnancy
- D. To prescribe therapy with radioactive iodine
- E. To prescribe Thiamazole

42. The patient is being treated for about heart disease, atrial fibrillation, chronic heart failure. She receives cardiac glycosides, nitrates, diuretics, potassium supplements. Treatment is ineffective. The palpitations, shortness of breath, edema of the lower limbs are stored. Objectively: height 160 cm, body weight 56 kg, moist skin. Edema of the legs. Tremor of fingers. Pulse - 128 / min, atrial fibrillation. AT - 180/70 mm Hg Pulse deficiency - 12 / min. The lower edge of the liver is 4 cm more than normal. Thyroid gland is diffusely enlarged, elastic. Determine the therapeutic tactic in this patient:

- A. Thyrostatics, antiarrhythmics, antiplatelet drug**
- B. Amiodarone, nitrates, cardiac glycosides
- C. Nitrates, diuretics, antiplatelet drug
- D. Beta-blockers, diuretics, antiplatelet drug
- E. Amiodarone, nitrates, cardiac glycosides, Euthyrox

43. Relatives of a 78-year-old woman turned to a local therapist in connection with her weight loss against a background of poor appetite, apathy, muscle weakness. Objectively: heart sounds are non-rhythmic, atrial fibrillation. BP 150/70 mm Hg. The abdomen is soft, painless. The liver is enlarged by 3 cm. The legs are swollen. Large tremor of fingers. On palpation of the thyroid gland - in the right lobe a node 1.5 cm in diameter. Establish a preliminary diagnosis.

- A Solitary thyroid nodule**
- B Cardiosclerosis

C Cerebrovascular atherosclerosis

D Stomach cancer

E Parkinson's disease

44. The patient 36 years old complains about palpitations, sweating, weight loss over the past 3 months by 5-6 kg. Appetite saved. Objectively: the skin is moist, heat, pulse rate 140 per minute, rhythmic, BP 130/60 mm.Hg. The thyroid gland is enlarged evenly, the Kocher's and Graefe`s sign is negative. What tests is needed to confirm the diagnosis?

A Thyroid hormones

B ECG

C Urine analysis

D Blood sugar

E General blood test

45. A 35 year old patient complains of irritability, insomnia, sweating. Objectively: the thyroid gland is diffusely enlarged. At radiometry in the thyroid gland, after 4 hours accumulated 60% of the prescribed drug. What pathology of the thyroid gland corresponds to the result of the study?

A Hyperthyroidism

B Euthyroid goiter

C Hypothyroidism

D Nodular goiter

E Cysts of the thyroid gland

Tasks for self-control

Task № 1

Patient, D., 22, a student, complains about irritability, inattention, feeling of heat, trembling of the body, palpitations, which depends on the position of the body and

time of the day, irritation in the eyes, double vision, the diarrhoea. She considers herself ill for 3-4 weeks, when after a nervous strain there was palpitations and irritability. Gradually joined other above-mentioned complaints. Heredity is not burdened. Objectively: the patient is fussy; height 178 cm, weight 70 kg, body temperature 37,2 ° C. The skin is warm, moist, turgor is preserved. Subcutaneous fat is moderately developed, no edema. Breathing in the lungs is vesicular, no wheezing. RR 19 per minute. The pulse on the radial arteries is the same on both sides, 100 per minute, rhythmic, satisfactory filling and voltage. Boundaries of relative cardiac dullness: right - on the right edge of the sternum, upper - lower edge of the third rib, left - 1.5 cm to the middle of the medioclavicularis line. The tones of the heart are muffled, rhythmic, at the apex systolic noise is heard. Heart rate 100 in 1 min., BP 140/70 mm Hg. The abdomen is soft, painless in all areas at superficial and deep palpation. The liver is not palpable, size 10 * 9 * 7 cm; palpation is painless. The Pasternatsky's sign is negative. The neck is thickened, the thyroid gland is visible while swallowing. Swollen bilateral exophthalmos. The Dalmelplia`s, Grefe`s, Stelvaga`s, Mobius`es, Elinek`s signs are positive.

Question:

1. Select and justify syndromes, select the main one.
2. What mechanism has appearance of complaints?
3. What complaints from the digestive system can be found at this patient?
4. 4. What can be found at this patient with palpation of the thyroid gland?
5. What are Grefe`s, Stelvaga`s, Mobius`es, Ellinek`s signs?
6. What with the appearance of changes in the cardiovascular system at objective research is connected??
7. Assign additional survey
8. State the pre-diagnosis

Examples of answers

1. Syndromes: thyrotoxicosis (symptomatic AH), endocrine ophthalmopathy.

2. Implementation of biological effects of high concentration of thyroid hormones: through the activation of the sympathetic nervous system, metabolic action, direct effect on the Zcardiovascular system.
3. Abdominal pain.
4. Diffuse toxic goiter grade 2
5. Eye symptoms. Grefe`s sign - the appearance of a white strip of sclera between the edge of the upper eyelid and the iris when the eye is fixed by the subject, which slowly moves down. Shtelwag`s sign - a rare flashing (less than 6 - 8 times per minute). Mobius`es sign is a violation (weakness) of convergence, that is, the loss of the ability to capture objects that are close at a glance. Ellinek`s sign - hyperpigmentation around the eyes.
6. Heartbeat - the implementation of biological effects of high concentration of thyroid hormones; AH - increase in cardiac output and decrease peripheral vascular resistance; systolic noise - acceleration of blood flow (functional noise).
7. TSH, T3, T4. Ab to r-TSH. Ultrasound of thyroid gland. ECG. echo, visiting ophthalmologist.
8. DTG. Mild thyrotoxicosis. Diffuse goiter grade 2. Ophthalmopathy grade 2.

Task №2

Patient M., 45 years old, an engineer, complains about progressive yellowing of the skin, weakness, reduced ability to work, periodic aching pain in the right hypochondrium, long dull headaches without a clear localization, constipation. She considers herself ill for about 4 years, when she began to notice the appearance of lethargy. The same time appeared acute pains in the right hypochondrium, due to which the patient was hospitalized; Diagnosed: cholecystitis, dyskinesia of the biliary tract, treatment performed without significant effect. The patient began to notice memory loss, frozen in hand and foot, hairloss, mixed character of dyspnea when rising to the 2nd floor. Weakness, apathy have progressed, during the last year added constipation. The patient was examined in connection with the suspicion on the oncological process, the tumor was not detected. Objectively: height 175 cm, weight 75 kg. Talking is slow. The voice is dull. Face is amiymic,

periorbital puffiness, puffiness of the lips. The skin is cold, dry, hyperkeratosis of elbows. Hair on the head is dull, rare. The sclera is clean. Fingers thickened. BR 16 in min. Breathing vesicular, no wheezing. The boundaries of relative cardiac dullness within the normal range. The tones of the heart are muffled, rhythmic. Heart rate 55 per minute. AT 120/80 mm Hg The tongue is clean, moist, enlarged in size, with imprints of teeth. The abdomen is soft, painless in all departments. The liver is not palpated; liver size 9 * 8 * 7 cm; Pasternatsky's sign is negative. The neck is thickened, the thyroid gland is visible when swallowing. The thyroid gland is enlarged, dense, painless, hilly, moving; regional lymph nodes are not palpable. The data of additional research methods are as follows: 1. CBC: Hb-96 g / l, er-3,1 × 10¹² / l, CI-0,78, leyk-7,1 × 10⁹ / l, ESR-18 mm / h . 2. Sugar - 3.5 mmol / l, fibrinogen - 4.0 g / l, bilirubin - 8.8 μmol / l, cholesterol - 6.8 μmol / l. 3. TSH - 18.5 μIU/mL (normal less than 4.0 μIU/mL)

1) Question:

1. Select and justify syndromes, select the main one.
2. What causes skin lesion?
3. What causes changes of face and fingers?
4. What is the mechanism of digestive system lesion?
5. What causes vessels system lesion at this patient?
6. Conclude lab tests.
7. Assign an additionally survey.
8. State the pre-diagnosis.

Examples of answers

1. Syndromes: hypothyroidism (intestinal dyspepsia, encephalopathy), diffuse goiter grade 2.
2. As a result of hypothyroidism, there is a decrease in the level of basic metabolism (skin cold, hyperkeratosis).
3. As a result of hypothyroidism, glycosaminoglycan metabolism disorders (edema, puffiness, thickening of fingers) develop.

4. Swelling of the mucous membranes (glycosaminoglycans), reducing of the gastrics and intestinal motility.
5. Heart disorder, violations of water-salt metabolism.
6. CBC: Hypochromic anemia of moderate severity. Biochemical blood test - hypercholesterolemia. Hormonal profile: signs of primary hypothyroidism..
7. TSH, T3, T4. Ab to r-TSH. Ultrasound of thyroid gland. ECG. Echo.
8. Autoimmune thyroiditis, hypothyroidism. Hypochromic anemia of mild degree.

1. Patient K., 15 years old. Complaints about periodic fatigue, especially in the second half of the day, some annoyance. In the school during the medical examination, goiter was detected. She is constantly live in the Skole district of the Lviv district. Good studing. Objectively: asthenic structure, development corresponds to age, on the side of internal organs - no pathological deviations. The thyroid gland is enlarged at the expense of all departments, visible only when the head is turned back; homogeneous consistency, soft, not painful. Laboratory indices: TSH - 1.33 mMo / L (N: 0.3-4.0), free T4 - 1.22 ng / dl (N: 0.93-1.70), anti-thyroid antibodies not detected. Ultrasound: the gland is evenly enlarged, the total volume is 10.6 ml, echogenicity is normal, the structure is homogeneous.

A. Formulate the diagnosis (nosology, goiter character, functional state of thyroid gland).

B. Identify and justify the optimal therapeutic approach.

2. A woman 44 years old complains about apathy, lethargy, memory impairment, chilliness, dryness of the skin, constipation, swelling of the face. She considers herself ill during the year. Objectively: temperature 36,00 C, pulse - 56 beats / min, BP - 110/80 mm Hg. ECG: reduction of the voltage, reduction of the wave P and flattening of the wave. T. thyroid is increased at the expense of all parts, visible at normal position of the neck, moderately condensed and heterogeneous, not painful. Laboratory examination: Free T4 - 7.5 pmol / l (N: 10-23), TSH - 16.4 mMo / l (N: 0.3-4.0), TPO antibodies - 640 IU / ml (N : <100). Ultrasound: Echogenicity is diffusely reduced, the structure is sharply inhomogeneous, without tissue formations.

1. Formulate the diagnosis (nosology, the nature of structural and functional changes in the thyroid gland).

2. Identify and justify the optimal therapeutic approach.

Task №3. A 3-month-old boy was hospitalized due to stubborn constipation and delayed jaundice. He is ill from birth. His mother`s pregnancy was complicated by toxicosis. At examination: low activity, face is swollen, macroglossia, skin is icteric, eye gaps narrow, muscle tone lowered, bradycardia.

- What is the most likely diagnosis?
- What surveys should be appointed?

Task №4. A 40-year-old patient complains about pain in the right half of the neck with irradiation in the jaw and ear, which is aggravated by swallowing; severe weakness, headache, irritability, feeling of heat, palpitations, tremor of hands. Patient felt ill suddenly 2 days ago, independently taking analgin, from which there was a short-term relief. A month ago there was an acute URTI. Anamnesis of life without features. Objectively: general state average condition, temperature 38,20 C, pulse - 112 beats / min, BP - 130/70 mm, tremor of fingers. The thyroid gland is enlarged mainly due to the right part, which is quite dense, with a smooth surface, is extremely painful. Changes in the left part are similar, but slightly pronounced. Laboratory indices: Hb - 112 g / l, L $6,1 \times 10^9 / l$, ESR - 52 mm / h, CRP (+++), TSH - 0,15 $\mu\text{IU/mL}$ (N: 0,3-4,0), free T4 - 38,6 pmol / liter (N: 10-23). Ultrasound: the gland is enlarged asymmetrically; the structure is sharply inhomogeneous due to multiple fuzzy-bounded hypoechoic (hydrophilic) sites; these changes relate primarily to the right part.

- Formulate a pre-diagnosis (in which you should indicate the probable nosology, the nature of structural changes and the functional state of the thyroid gland);
- Provide differential diagnosis with similar pathological conditions.

Task №5. At a patient 35 years during a medical examination a node in the right part of the thyroid gland was detected. There are no complaints. Heredity is not burdened. From the anamnesis it is known that in adolescence due to injury of the

cervical spine several times a radiological examination was performed. Objectively: in the lower half of the right particle there is the nodal formation which a diameter is 2.5 cm, a dense consistency, with a hilly surface, moving, not painful. The left particle is not enlarged, soft, homogeneous. Neck lymph nodes are not palpable.

- What is the most likely diagnosis?
- What surveys should be appointed? Which of them will be the most informative?

Task №6. Patient S., 68, complains about weakness of the muscles and edema of the lower extremities, emotional lability, increased sweating, heart failure, dyspnea while light load. He is ill for 2 years, treatment at the district therapist (nitrates, cardiac glycosides, diuretics) is ineffective. Objectively: the legs are swollen, the pulse is about 112 beats / min., Flashing arrhythmia, BP 150/60 mm Hg, ocular symptoms are absent. The thyroid gland is enlarged due to a well-defined nodal formation with a diameter of 2 cm in the left lobe, tight-elastic, moving, visible in the normal position of the head. Ultrasound: the left part contains a gypoecheogenic formation of 2.3x1.8 cm, clearly delineated, the bloodflow is amplified. Scintigraphy with ^{99}Tc perchnetat: "hot zone" in the projection of the node. Laboratory parameters: TSH - 0.005 $\mu\text{IU/mL}$ (N: 0.3-4.0), fT4 - 26.6 pmol / l (N: 10-23).

- Formulate a diagnosis (nosology, clinical-pathogenetic form, severity, stage).
- Determine treatment tactics.

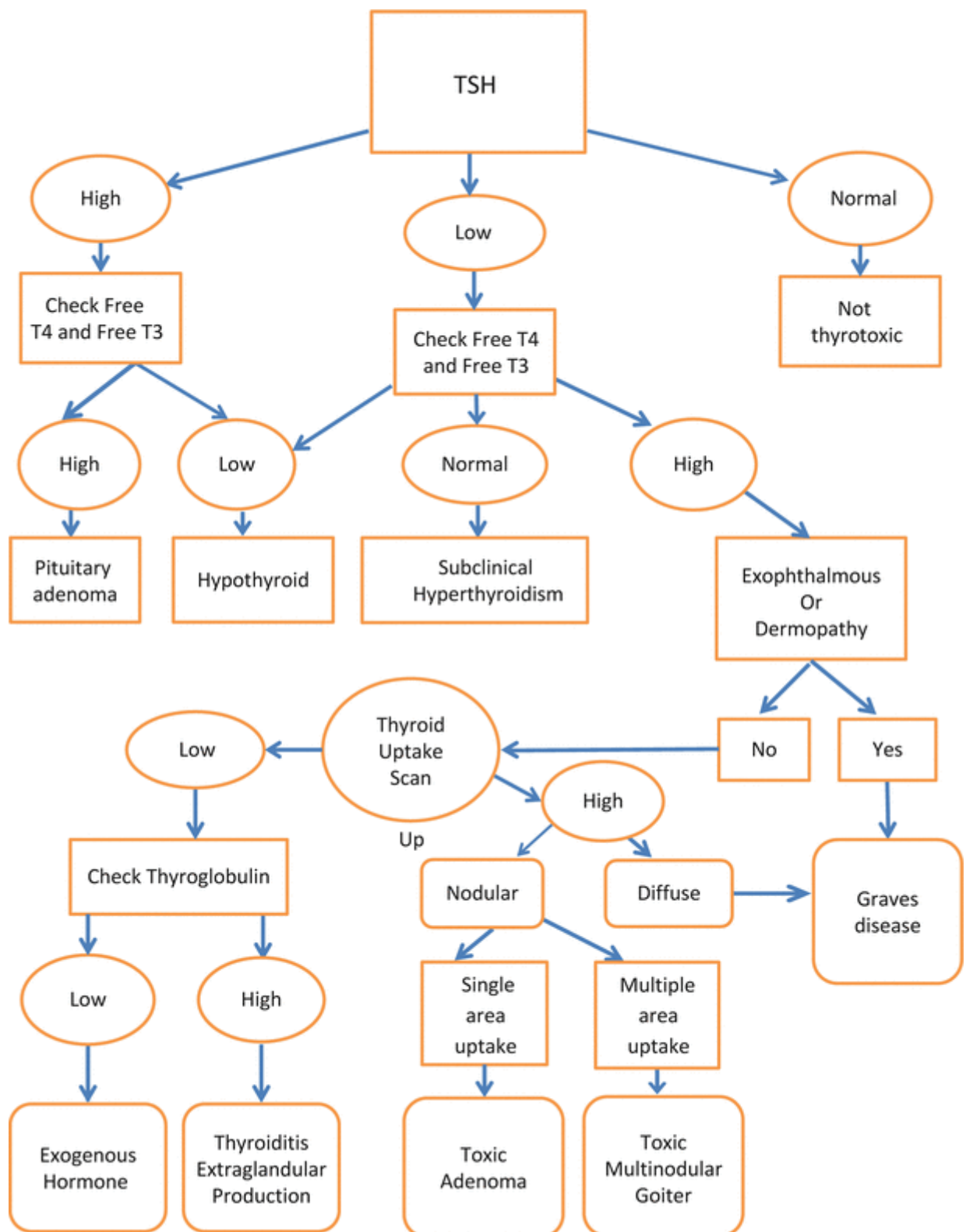
Abbreviations used in the results of laboratory and instrumental tests

AB-TG	Antibodies to thyroglobulin
AB-TPO	Antibodies to thyroid peroxidase
AB-rTSH	Antibodies to TSH receptors
ELISA	Enzyme-linked immunosorbent assay
CT	Calcitonin
TG	Thyroglobulin
TSH	Thiorotropic hormone
T3	Triiodothyronine
total T3	Total triiodothyronine
f T3	Free triiodothyronine
T4	Thyroxine
total T4	Total thyroxine
f T4	Free thyroxine
FNA	Fine needle aspiration biopsy
USD	Ultrasound diagnostics
TG	Thyroid gland

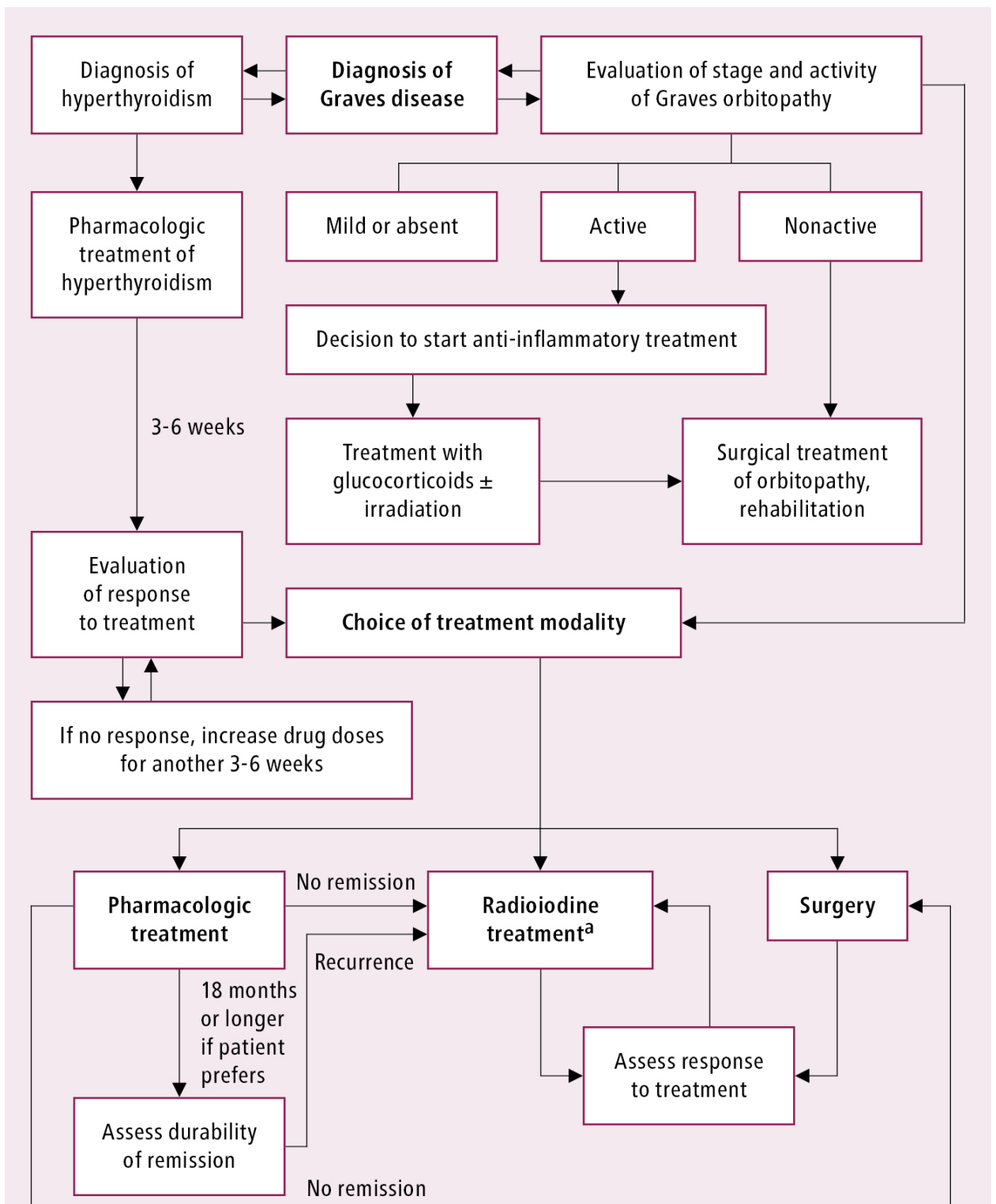
Basic laboratory parameters and their interpretation

№	Name	Unit	Reference values
1	TSH	μIU/ml	0,4 - 4,0 Pregnant 0,2-3,5
2	Free T3	Nmol/l	1,3-2,7
3	Free T4	Nmol/l	2,3-6,3
4	Free T3	Nmol/l	54-156 Pregnant..I tr 100-209 Pregnant II, III tr 117-236
5	Free T4	Pmol/l	10,3-24,5 I tr 10,3-24,5 Pregnant..II,III tr 8,2-24,7
6	TG	ng/ml	<56
7	Calcitonin		
8	AB-TPO	UI/l	<65
9	AB-TG	UI/l	<35
10	AB-rTSH	UI/l	<1,8 negative 1,8-2,0 doubtful >2,0 positive

Laboratory assessment of thyroid function

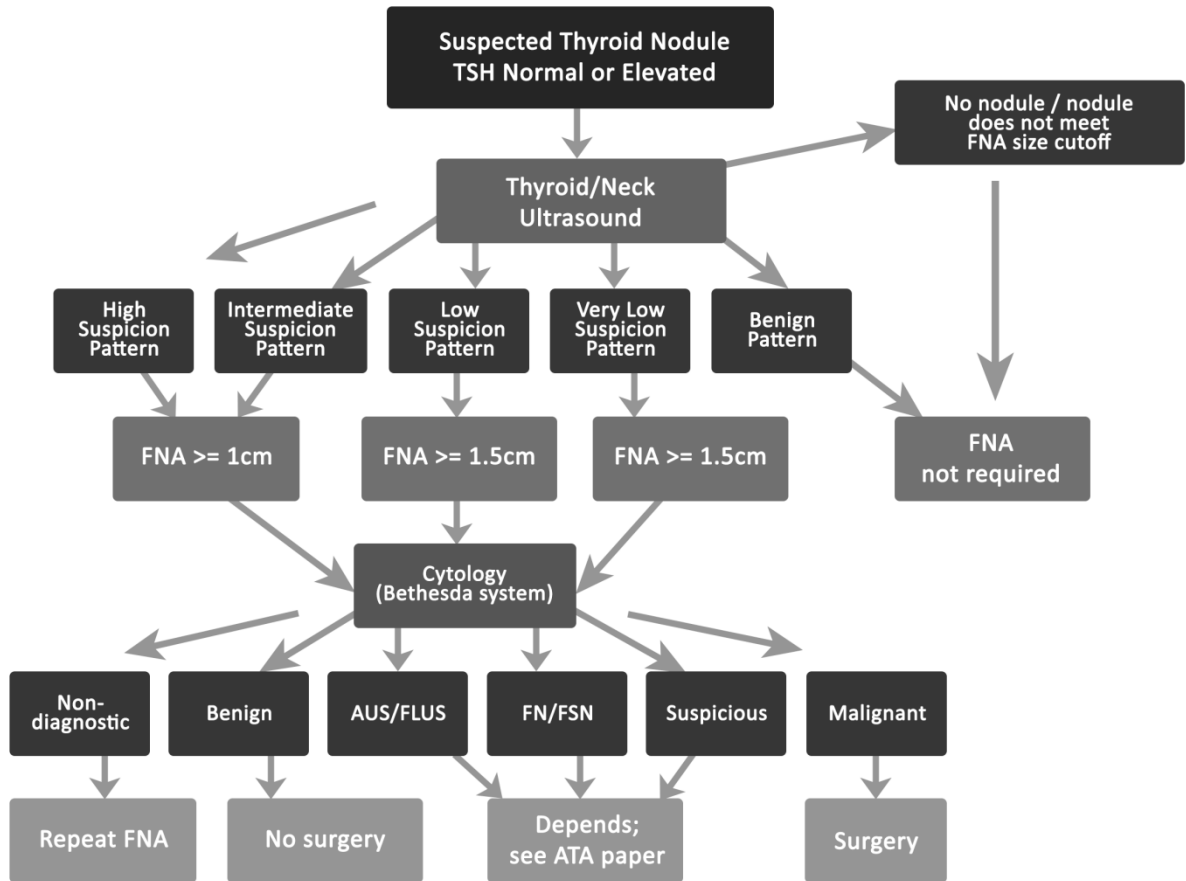


The algorithm for managing patients with toxic diffuse goiter



^a Good response to the first course of radioiodine treatment is achieved in ~70% of patients. In patients with moderate symptoms of hyperthyroidism, radioiodine treatment may be started without pretreatment with antithyroid drugs.

Algorithm for managing patients with nodal forms of goiter.



Diagnostic criteria for main diseases of thyroid gland [14,15].

Diffuse nontoxic goiter.

ICD 10 code – E 04.0

Definition: Diffuse enlargement of the thyroid gland without dysfunction.

Formulation of the diagnosis: Diffuse goiter grade 2. Euthyroidism.

Criteria for diagnosis:

1. Clinical:

- Complaints about enlargement of the thyroid gland
- Palpation of the thyroid gland: the thyroid gland is painless, soft-elastic, mobile, the surface is smooth.

2. Paraclinical:

- Increase in the volume of the thyroid gland: for adults - more than 18 cm³ for women and 25 cm³ for men (according to ultrasound)
- Ultrasound: the thyroid gland is evenly enlarged, the echo is normal or moderately reduced, structure is homogeneous or with the presence of fibrosis foci (with prolonged illness).
- Hormonal studies: normal levels of TSH, free T4.
- Titer antibodies to TPO are normal or elevated less than 2-3 times compared to normal.

Classification of goiter size (WHO, 2001)

Grade	Characteristic
0	No goiter
I	The thyroid gland is not visible to the eye, but is visible when swallowing. The size of each lobe is larger than the distal phalanx of the thumb. At the same time, one or several

	nodes are palpable against the background of a gland of normal size
II	Goiter is palpable and visible to the eye

Endemic goiter

ICD 10 code - E 01.0

Definition: endemic goiter is an enlargement of the thyroid gland occurring in a significant number of people living in geographic areas with iodine deficiency in the environment.

Epidemiological criteria for assessing the degree of iodine deficiency

Criteria	Population	Severity of iodine deficiency		
		Mild	Moderate	Severe
Goiter frequency (%) according to palpation data	schoolchildren	5,0 - 19,9%	20,0 - 29,9%	> 30,0%
Goiter frequency (%) according to ultrasound examination	schoolchildren	5,0 - 19,9%	20,0 - 29,9%	> 30,0%
Concentration of iodine in urine (median, µg / l)	schoolchildren	50 - 99	20 - 49	< 20
Frequency of TSH > 5 mIU / ml at neonatal screening	babies	3,0 - 19,9%	20,0 - 39,9%	> 40,0%
Thyroglobulin level in the blood (median, ng / ml)	children, adults	10,0 - 19,9	20,0 - 39,9%	> 40,0

Criteria for diagnosis:

1. Clinical:

- Anamnesis: living in an endemic area.
- Palpation of the thyroid gland: the thyroid gland is painless, soft-elastic, mobile, the surface is smooth.

2. Paraclinical :

- Ultrasound of the thyroid gland (if goiter grade 2 or nodular forms are detected)

At diffuse goiter:

- change of echo density (increase or decrease)
- coarse grit, often with small cystic inclusions.

At nodular goiter:

- the presence of a volumetric formation (one or several) with a pronounced capsule.

1. Euthyroid goiter:

Clinical manifestations:

- At a small increase in the thyroid gland there are no complaints.
- At large sizes of the thyroid gland the severity of symptoms is determined by the grade of thyroid gland: enlargement:
 - Discomfort in the neck area.
 - A feeling of pressure in the neck area
 - Swallowing discomfort.
 - Difficulty breathing.
- Hormonal studies: normal blood levels of TSH, fT4.

2. Hypothyroid goiter:

Clinical manifestations:

- Subclinical hypothyroidism:
 - There are no complaints
 - The diagnosis is made at the level of TSH in the blood > 2.0 mU / l and the normal level of fT4.

Hypothyroidism

ICD 10 codes:

- E 00 - Congenital iodine deficiency syndrome
- E 02 - Subclinical hypothyroidism
- E 03.0 – Congenital hypothyroidism with diffuse goiter
- E 03.1 - Congenital hypothyroidism without goiter
- E 03.2 – Drug induced hypothyroidism
- E 03.3 – Postinfectious hypothyroidism
- E 03.4 – Atrophy of thyroid (acquired)
- E 03.5 – Myxedema coma
- E 03.8 – Other specified hypothyroidism
- E 03.9 – Hypothyroidism, unspecified

Definition: hypothyroidism is a clinical syndrome caused by prolonged, persistent deficiency of thyroid hormones in the body or a decrease in their biological effect at the tissue.

Formulation of the diagnosis:

- Primary hypothyroidism due to moderate autoimmune thyroiditis in the state of drug compensation. Hypothyroid encephalopathy stage I.
- Congenital hypothyroidism, severe form in a state of decompensation. Cretinism.

Classification.

A. By the level of defeat:

1. Primary (thyrogenic)
2. Secondary (pituitary), tertiary (hypothalamic)
 - a. Panhypopituitarism
 - b. Isolated deficiency of TSH
 - c. Anomalies of the hypothalamic-pituitary system

3. Peripheral – thyroid hormone resistance

1. Congenital:

a. Abnormalities of the thyroid gland: dysgenesis (agenesis, hypoplasia, dystopia, ectopia);

b. congenital enzymopathies, accompanied by a violation of biosynthesis of thyroid hormones; defective receptor to TSH;;

c. Congenital panhypopituitarism;;

d. Transient;

2. Acquired:

- Thyroiditis,

- Postprocedural hypothyroidism (operations on the thyroid gland)

- Drug-induced hypothyroidism

- Endemic goiter

By clinical course:

1. Transient

2. Subclinical (minimal thyroid failure)

3. Manifest

By Compensation:

1. Compensated

2. Decompensated

Complications: encephalopathy, cretinism, polyneuropathy, myopathy, myxedema coma, impaired sexual development, etc.

Criteria for diagnosis:

1. Clinical:

- Reducing intelligence to varying degrees

- Growth delay
- Disorders of sexual development
- Dryness, pallor of the skin
- Dry hair
- Edema of the face, limbs and tongue
- Bradycardia

2. Paraclinical:

- General blood test: anemia, sometimes accelerated ESR
- Increase in blood cholesterol, b-lipoproteins
- ECG: sinus bradycardia, reduction of the voltage of the teeth, delayed conduction, elongation of systole
- Ultrasound examination
- Hormonal study
- In subclinical hypothyroidism: an increase in thyroid-stimulating hormone (TSH) (above 2.5 mU / l, but not above 10 mU / l) with a normal level of free T4 and the absence of clinical symptoms.
- In case of manifest hypothyroidism - an increase in TSH above 10 mU / l and a decrease in free T4
- In secondary hypothyroidism the level of TSH in the normal range or reduced, free T4 reduced.
- X-ray of the hands: delayed "bone" age, epiphyseal dysgenesis
- For the diagnosis of AIT as the cause of hypothyroidism: the titer of antibodies to thyroperoxidase in 2-3 times higher than the upper normal limit.

Thyrotoxicosis [hyperthyroidism]

ICD 10 codes:

- E 05.0 Thyrotoxicosis with diffuse goiter
- E 05.1 Thyrotoxicosis with toxic single thyroid nodule
- E 05.2 Thyrotoxicosis with toxic multinodular goiter
- E 05.4 Thyrotoxicosis factitia
- E 05.5 Thyrotoxic crisis, coma
- E 05.8 TSH-secreting pituitary adenomas
- E 05.8 Iodine induced hyperthyroidism
- E 05.9 Thyrotoxicosis, unspecified
- P 72.1 Transient neonatal thyrotoxicosis
- E 06.1 Subacute thyroiditis (thyrotoxic phase)
- E 06.2 Chronic thyroiditis with transient thyrotoxicosis
- E 06.3 Chronic lymphocytic thyroiditis with transient thyrotoxicosis

Terminology:

- Thyrotoxicosis - a syndrome due to the prolonged increase in T4 and T3 in blood and tissues with characteristic clinical manifestations.

- Hyperthyroidism - increased secretion of thyroid hormones by thyroid gland.

Causes of thyrotoxicosis syndrome:

1. Thyrotoxicosis due to increased production of thyroid hormones by thyroid gland:

TSH – independent:

- Diffuse toxic goiter

- Thyroid adenoma

- Multinodular toxic goiter

- Iodine-induced thyrotoxicosis

- Well differentiated cancer of the thyroid gland

- Gestational thyrotoxicosis

- Chorionic carcinoma and molar pregnancy

TSH-dependent:

- Thyrotropinoma

- Syndrome of inadequate TSH secretion (thyroid resistance to thyroid hormones)

2. Thyrotoxicosis, which is not associated with elevated production of thyroid hormones:

- Thyrotoxic phase of autoimmune, subacute viral and postpartum thyroiditis.

- Amiodarone-induced

- Iatrogenic

3. Thyrotoxicosis due to the production of thyroid hormones outside the thyroid gland:

- Struma ovarii

- Functionally active metastases of the thyroid gland cancer

Diffuse toxic goiter

ICD 10 code - E. 05

Definition: diffuse toxic goiter - an autoimmune disease characterized by persistent increased secretion of thyroid hormones, usually accompanied by a diffuse enlargement of the thyroid gland, in 50-70% of cases accompanied by endocrine ophthalmopathy.

Criteria for diagnosis

1. Clinical:

Organs and systems	Symptoms of defeat
Thyroid gland	Diffusely enlarged due to both lobes and isthmus,

	painless, mobile, elastic consistency. Auscultation of vascular noise is heard above the gland.
Skin	Warm, smooth, wet. Diffuse sweating. Brittle nails, hair loss.
Cardiovascular system	Tachycardia, enhanced apical impulse, accented heart sounds. Constant, rarely paroxysmal sinus tachycardia, extrasystole. Paroxysmal, rarely constant atrial fibrillation, predominantly systolic hypertension, an increase in pulse pressure of more than 60 mm Hg, myocardial dystrophy, heart failure ("thyrotoxic heart")
Digestive system	Tendency to diarrhea, relatively rarely - abdominal pain. Increased peristalsis, thyrotoxic hepatitis.
Nervous System	Increased irritability, tearfulness, fussiness, impaired concentration, sleep disturbance. Marie`s sign, ect.
Muscular system	Muscle weakness, fatigue, atrophy, myasthenia, periodic paralysis. Proximal thyrotoxic myopathy.
Accelerating metabolism	Intolerance to heat, weight loss, increased appetite, thirst, accelerated growth, skeletal differentiation. Hypercalcemia, hypercalciuria.
Eyes	Eye symptoms (see below) develop as a result of a violation of the vegetative innervation of the eye. Eyelids are much enlarged, exophthalmos, frightened or wary eyes, blurred vision. Eye symptoms of thyrotoxicosis are fundamentally different from an independent disease - endocrine ophthalmopathy (EOP)
Other endocrine organs	Secondary diabetes mellitus or impaired carbohydrate tolerance. Relative (at normal cortisol level) adrenal insufficiency (danger of developing acute adrenal insufficiency due to stress): moderate severity of hyperpigmentation of skin folds, scars, areola, genitalia.
Reproductive system	In women - a violation of the menstrual cycle. Men have gynecomastia.
Diseases associated with DTG	Endocrine ophthalmopathy, pretibial myxedema. Very rarely - acropathy: the periosteal osteopathy of the feet and hands radiographically resembles "soap foam".

Eye symptoms

Graefe`s sign	Is the lagging of the upper eyelid on downward rotation of the eye
Kocher's sign	In fixation on a fast upwards movement there occurs a convulsive retraction of the eyelid.

Mebius`es sign	When fixing the look on a close object, the eyes cannot be in the position of convergence for a long time
Stilevag`s sign	not frequent and incomplete blinking
Dalrymple`s sign	Wide opening of the palpebral fissure, surprised, frightened eyes
Krause`s sign	Intensified eye shine

Severity of thyrotoxicosis

Subclinical	Lack of clinical manifestations of thyrotoxicosis. Reduced or suppressed TSH level against the background of normal T3 and T4.
Manifest	Clinical symptomatology. Decrease in TSH levels in combination with increased T4 and / or T3 levels.
Complicated	Complications (atrial fibrillation, heart failure, relative insufficiency of the adrenal glands, dystrophic changes in parenchymal organs, psychosis, severe weight deficiency)

2. Paraclinical:

Required

- Reduced blood levels of TSH, increased free T4 and / or free T3 (at subclinical thyrotoxicosis - normal levels of fT4 and fT3).
- Ultrasound: diffuse enlargement of the thyroid gland (not a necessary criterion for diagnosis). With color Doppler mapping - increased blood flow throughout the thyroid gland.
- Carbohydrate tolerance test - disturbance of carbohydrate tolerance or diabetes mellitus.

Additional:

- Increased stimulatory antibodies to the TTB receptor (TSAb).
- Increased antibodies to the TPO

- In case of suspected adrenal insufficiency - a study of the level of free cortisol in the blood (in the morning) or in the daily urine, the electrolyte content in the blood (K, Na)
- In the case of EOP - signs of thickening of retrobulbar muscles according to ultrasound, CT, MRI.

Acute thyroiditis

ICD 10 code - E 06.0

Definition: acute thyroiditis (acute purulent thyroiditis) - acute inflammation of the thyroid gland of bacterial etiology.

Formulation of the diagnosis: Acute thyroiditis, euthyroidism.

Criteria for diagnosis:

1. Clinical:

Anamnesis:

- Moved purulent infection (acute tonsillitis, otitis, periodontitis, etc.), sepsis, immune deficiency.
- Penetrating thyroid gland trauma.
- Defects of the thyroid-duct (fistula, cyst) development.

Clinical picture:

- Febrile temperature.
- Thyroid gland enlargement (often asymmetric) with a characteristic dense and palpation pain with irradiation of pain in the ear, neck, lower jaw.
- Increased cervical lymph nodes
- The skin over the thyroid gland is red, hot, fluctuation may be detected.

2. Paraclinical:

Required

- In the general analysis of blood - leukocytosis with a shift to the left, moderate acceleration of ESR.
- Ultrasonography of the thyroid gland - not clearly defined areas of echogenicity reduction or anechoic.
- Euthyroidism is usually preserved. Possible insignificant transient increase in T3 and T4 levels (destructive)
- At a puncture biopsy conduct a morphological and bacteriological study (with the definition of sensitivity of flora to antibacterial drugs).

Additional

- On thyroid scintigraphy - "cold" areas.

Differential diagnostics:

Characteristic	Acute thyroiditis	Subacute thyroiditis
Ethiology	Bacterial (Streptococcus pyogenes, Staphylococcus aureus, Streptococcus pneumoniae)	Viral
Anamnesis	Connection with bacterial infection, traumatic defects, anomalies of thyroid-duct.	Connection with the previous viral infection
Body temperature	Febrile	Usually subfebrile
Thyroid gland	Asymmetric enlargement of the thyroid gland. Pain in the projection of the thyroid gland, especially during palpation. Irradiation of pain in the ear, neck, lower jaw. The skin above it is red and hot. Fluctuation can be detected.	Enlargement (more often asymmetric), painful, dense.
Thyroid gland function	Usually there is no function disorder	Typical staging: first 1-4 weeks can be mild thyrotoxicosis, next 2-9 month can be mild hypothyreosis, next euthyreosis.

CBC	Left shift leukocytosis ESR moderately elevated	Leukocytosis Maybe lymphocytosis ESR much elevated
Ultrasound of thyroid gland	Foci of abscess formation	Cloudy area with reduced echogenicity without a clear capsule which usually takes at least 1/3 of the gland particle, which changes its size and location during the observation process
Antithyroid autoantibodies	Absent	Can appear on 3d week of disease and persist during 6-12 month
FNAB	Picture of acute thyroiditis	Picture of subacute thyroiditis
Result	Possible complications: spontaneous disclosure of abscess, cervical thrombophlebitis, relapsing course if anatomical defects are not eliminated	As a rule complete recovery

Subacute thyroiditis

ICD 10 code - E 06.1

Definition: subacute thyroiditis - an inflammatory disease of the thyroid gland, manifested by thyrotoxicosis syndrome, local and general infectious-inflammatory symptoms.

Formulation of the diagnosis: subacute thyroiditis, thyrotoxicosis.

Criteria for diagnosis:

1. Clinical:

- Connection with moved a viral infection
- Pain in the projection of the thyroid gland radiating to the neck, ear, lower jaw, back of the head, pain when swallowing, dysphagia is possible.

- Moderate enlargement of the thyroid gland, often asymmetric, gland tissue is dense, painful on palpation.
- Increase in body temperature
- Clinical signs of mild or moderate thyrotoxicosis (weakness, palpitations, sweating, emotional lability, tachycardia, etc).
- Thyrotoxicosis is transient, destructive in nature and usually lasts for the first 1-4 weeks. In the future, within 2-9 months, it is possible to change the function of the thyroid gland: from mild hypothyroidism to euthyroidism.
- There may be recurrences of thyroiditis within 3-6 months. with a change in the localization of pain.

2. Paraclinical:

a. Required:

- Increased ESR
- Ultrasound examination - areas of low echogenicity without clear boundaries
- In the stage of transient thyrotoxicosis: the level of TSH is moderately reduced, free T3 and free T4 are elevated.

b. Additional:

- Increase in the level of a-2-globulin
- Increase in the level of fibrinogen
- Scintigraphy of the thyroid gland - reducing accumulation

Autoimmune thyroiditis

ICD 10 code - E 06.3

Definition: autoimmune thyroiditis (AIT) is a chronic disease characterized by a number of features of the clinical picture and course caused by the recent debut of the disease and therefore minimal morphofunctional changes of the thyroid gland in the initial stages of the immunopathological process.

Formulation of the diagnosis:

- Autoimmune thyroiditis, hypertrophic form, goiter grade 2. Euthyroidism

- Autoimmune thyroiditis, atrophic form. Hypothyroidism, severe form, state of decompensation. Secondary (hypothyroid) anemia. Hypothyroid encephalopathy 1 st.

Classification:

1. According to the functional state of the thyroid gland:

- Hypothyroidism
- Euthyroidism
- Thyrotoxicosis

2. The size of the thyroid gland:

- Hypertrophic form
- Atrophic form

3. Clinical course:

- Latent
- Clinical

4. By nosological form:

- AIT as an independent disease
- AIT in combination with other thyroid diseases (subacute thyroiditis, nodule, DTG)
- AIT as a component of autoimmune polyendocrine syndrome

AIT Risk Factors:

1. Family history with autoimmune diseases of the thyroid gland (diffuse toxic goiter, AIT, autoimmune ophthalmopathy);
2. Premorbid history of the patient with goiter, burdened with autoimmune somatic pathology (vitiligo, focal alopecia, systemic lupus erythematosus, hemolytic

anemia, autoimmune thrombocytopeny, rheumatoid arthritis, celiac disease) and / or autoimmune endocrinopathy.

3. X-ray radiation of the head, neck and upper chest (for medical purposes) and / or low-intensive radiation of the thyroid gland with radioiodine and the whole body with radiocaesium (due to residence since 1986 in the regions affected by the Chernobyl accident)

4. Burdened allergological anamnesis in a patient with goiter - a combination of three or more allergic manifestations, especially at puberty with a process duration of more than 7 years.

Criteria for diagnosis

There is no way to diagnose AIT based on the use of any single diagnostic criterion. The main diagnostic principle is the application of an integrated approach:

- At the first stage of diagnosis, ultrasonography of the thyroid gland is carried out, the study of antithyroid antibodies

- To clarify the thyroid function and determine the phase of the flow of AIT - TSH, fT3, fT4 in serum.

- By special indicators - morphological verification with the use of fine needle aspiration.

I. Hypertrophic form of AIT (Hashimoto's disease) is diagnosed with the total presence of the following mandatory signs:

- High titre of antibodies to thyroid peroxidase
- ATPO in serum - above the maximum threshold of the "gray zone" or 2 and more times higher than the upper limit of the "norm".

- The increase of thyroid gland: more than 18 cm³ for women and 25 cm³ for men.
- Ultrasound changes in the structure of the thyroid gland: diffuse heterogeneity
- Reduction of thyroid function in AIT is not an obligate symptom of the disease and is not its main diagnostic criterion. However, the presence of acquired primary hypothyroidism in adolescence should be regarded as a result of AIT (atrophic or hypertrophic form)

II. The diagnosis of AIT is probabilistic in patients with:

1. An increase in the thyroid gland and a characteristic change in its echostructure according to ultrasound data, in the absence of an increase in the ATPO titer;
2. Enlargement of the thyroid gland and the presence of an increase in the ATPO titer in the absence of characteristic changes in the echostructure of thyroid tissue according to an ultrasound scan;
3. An increase in the thyroid gland in the absence of characteristic changes in ultrasound changes and a high level of antithyroid autoantibodies in cases of an increased individual risk of AIT.

Other diagnostic options

1. When the unchanged echogram of the thyroid gland is combined with the absence of ATPO in the blood serum, a diffuse endemic goiter is diagnosed when living in an endemic iodine-deficient locality;
2. In a doubtful situation, when there is a rather suspicious picture with ultrasound, but antibodies are not detected (including with repeated analyzes), a puncture biopsy can be performed.