Ministry of Health of the Republic of Belarus

Educational Establishment

«Vitebsk State Order of Peoples` Friendship Medical University»

Chair of Propedeutics of Internal Diseases

 It predicated on methodical

 meeting of the chair from

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 The report № \_\_\_\_\_\_

**Information Block for lesson N4**

for the practical training

on Propaedeutics of Internal Diseases

for specialty 1-79 01 01 "General medicine"

2 course of medical faculty

full-time form of higher education

**THEME:** Subjective and objective methods of examination of patients with diseases of the thyroid gland, lymph nodes, musculoskeletal system. Laboratory and instrumental examination methods for diseases of the thyroid gland, lymph nodes, musculoskeletal system

Vitebsk, 2025

**Questions for classroom knowledge control.**

 1. Subjective method of examination of patients with thyroid gland diseases: complaints, features of the present disease history, past life history. Diagnostic value. Objective method of examination of patients with thyroid gland diseases. Palpation of the thyroid gland. Degrees of the thyroid gland enlargement according to WHO. Laboratory and instrumental methods of examination in thyroid gland diseases. Diagnostic value.

2. Subjective method of examination of patients with lymph node diseases: complaints, peculiarities of the present disease history, past life history. Diagnostic value. Objective method of lymph nodes examination. Palpation of lymph nodes. The concept of lymphoadenitis and lymphoadenopathy. Diagnostic value. Laboratory and instrumental methods of examination. Diagnostic value.

3. Subjective method of examination of patients with diseases of the musculoskeletal system: complaints, peculiarities of the present disease history, past life history. Diagnostic value. Objective methods of examination of the musculoskeletal system: general and local survey, examination of degree of the muscle development, determination of the muscle strength, detection of changes in the shape of bones, the presence of deformation, pain, determination of the defiguration and deformation of joints, determination of the active and passive mobility. Laboratory and instrumental methods of research. Diagnostic value

 **Information block of the topic**

The thyroid gland is an endocrine gland that is present on the anterior side of the neck, in front of the trachea. It consists of two lobes (left and right), which are connected by a central isthmus anteriorly – this produces a butterfly-shape appearance.

**Functions/Roles of the thyroid gland**

The thyroid makes hormones that regulate all cells in the body. They help control:

* Metabolism – breaking down foods to make energy
* Energy levels – production and use by cells in the body
* Body temperature/heat production
* Oxygen use by cells in the body
* Heart rate and blood flow
* Bone growth
* Calcium levels
* Vitamin metabolism
* Brain development, particularly before birth and during childhood
* Reproductive function

There are specific kinds of thyroid disorders that include:

* [Hypothyroidism](https://www.medicinenet.com/hypothyroidism/article.htm)
* [Hyperthyroidism](https://www.medicinenet.com/hyperthyroidism/article.htm)
* Goiter
* [Thyroid nodules](https://www.medicinenet.com/thyroid_nodules/article.htm)
* [Thyroid cancer](https://www.medicinenet.com/thyroid_cancer/article.htm)

**Clinical Investigation:**

*Hypothyroidism*

• Coarse and dry hair

• Confusion or forgetfulness (often mistaken for dementia in seniors)

• Constipation

• Depression

• Dry, scaly skin

• Fatigue or a feeling of sluggishness

• Hair loss

• Increased menstrual flow (women)

• Intolerance to cold temperatures

• Irritability

• Muscle cramps

• Slower heart rate

• Weakness

*Severe form of Hypothyroidism (Myxedema)*

• Low body temperature

• Dulled mental processes

• Congestive heart failure

• Myxedema coma (loss of consciousness, seizures, slowed breathing)

*Hyperthyroidism*

• Increased heart rate with abnormal rhythm or pounding (palpitations)

• High blood pressure

• Increased body temperature (feeling unusually warm)

• Increased sweating

• Clamminess

• Feeling agitated or nervous

• Tremors in the hands

• Feeling of restlessness even though the person is tired or weak

• Increased appetite accompanied by weight loss

• Interrupted sleep

• Frequent bowel movements, sometimes with diarrhea

• Puffiness around the eyes, increased tears, sensitivity to light, or an intense stare

 • Bone loss (osteoporosis) • Stopped menstrual cycles

**Thyroid gland examination**

***Inspection***

Thyroid gland normally lies below the thyroid cartilage on the anterior neck. This location allows an examiner to inspect and palpate this bilobular organ, which in the adult human being weighs from 15 to 25 g. The inspection of the anterior surface of the neck can reveal the size of the thyroid gland. The patient should seat or stand in a comfortable position with the neck in a neutral or slightly extended position. The cross-lighting increases shadows and improves the detection of masses. To enhance the visualization of the thyroid gland, the doctor asks the patient to extend his/her neck, which stretches the overlying tissues, and the patient should swallow a sip of water, watching for the upward movement of the thyroid gland.

After completing anterior inspection of the thyroid gland, the doctor observes the neck from the side, and estimates from the cricoid cartilage to the suprasternal notch.

***The thyroid gland in norm is usually invisible on examination.***

Examination of the thyroid gland are gives an approximate idea of its size and symmetrical or asymmetrical enlargement of its different parts, and points to any surgical scars, obvious masses, or distended veins. It is necessary to pay attention to the character of breathing of patients with thyroid diseases. Breathing may be stridor-like (i.e. noisy, low-pitched, and audible in the distance), when trachea is compressed by benign or malignant tumor of the thyroid gland.

A large retrosternal goiter may cause a venous distention over the neck and difficulty breathing. Hyperemia and facial cyanosis when both arms are raised (*Pemberton's sign*) is possible due to venous occlusion in retrosternal goiter.

In addition to the examination of the thyroid gland itself, the physical examination should include a search for signs of the abnormal thyroid function.

***Palpation of the thyroid gland***

The thyroid gland is attached to the trachea and moves with it when swallowing. The other cervical masses do not move significantly. In order to successfully palpate the thyroid gland, the neck muscles must be as relaxed as possible. This is done by asking the patient to tilt the head slightly forward, with the chin parallel to the horizontal surface.

The thyroid gland is palpated in an upright position. There are several techniques for palpation of the thyroid gland. Tentative palpation by mild tips of the bent fingers of the right arm assesses the density of the organ, the character of its surface, and the presence of nodes. Tentative palpation of the thyroid gland is repeated during swallowing movements of the patient. By asking the patient to swallow, thyroid consistency can be better appreciated as the gland moves beneath the examiner's fingers.

***The most commonly used techniques for palpation of the thyroid gland***.

*А. The examiner is in front of the patient*.

Palpation is performed with the thumbs of both hands. The second to fifth fingers of both hands are placed behind the posterior edges of the *m. sternocleidomastoideus,* and the thumbs are placed horizontally at the inferior edge of the thyroid cartilage. The patient is asked to make swallowing motions (swallowing saliva). The thyroid gland (together with the larynx) moves and slips under the examiner's fingers. Palpation of one lateral lobe of the gland can be facilitated by pressing the thyroid cartilage on the opposite side.

This technique allows to identify small changes in the thyroid gland, the mobility of the gland when swallowing, tenderness, and the presence or absence of nodules.

*B.* *The examiner is positioned in front of the patient and slightly to the right*.

The thyroid gland is palpated by the second-third-fourth fingers of the right hand in a horizontal line over the sternum notch. The left hand holds the neck in place.

The palpating fingers move up and down in a vertical line. They are then fixed over the sternum, and the patient is asked to make a swallowing movement (a sip of the saliva) at this point. The thyroid isthmus is palpated by the sliding movements of the examining fingers in the direction of the sternal manubrium. While swallowing, the isthmus of the thyroid gland slips under the fingers.

*C. If the thyroid gland is significantly enlarged, the doctor palpates it behind the standing or sitting patient*.

 The fingers of both hands (except the thumb) are placed over the projection of the thyroid gland. When saliva is swallowed, the fingers slide over the anterior surface of the gland.

***Normally, when the thyroid gland is palpated, the volume of its lobes does not exceed the volume of the distal phalanx of the thumb of the patient.***

When the thyroid gland is enlarged, it becomes visible. It gives the sensation of a soft or moderately dense roller that rolls over when swallowing. The thyroid gland in most diseases is mobile, and it is not adherent to the underlying tissues.

 In addition to its usual localization (in the area of the anterolateral surfaces of the neck, inside ofthe *m. sternocleidomastoideus*), the thyroid gland can occupy an atypical position: *intrathoracic goiter (substernal, or retrosternal struma)*, as a ring around the trachea and esophagus (*annular goiter*), *lingual goiter* (in the root of the tongue), *struma sublingualis*, *nasal goiter*. Goiter may develop from an additional lobe or the ectopic tissue of the gland.

According to the form of the enlarged thyroid gland, the presence or the absence of the nodules, it is distinguished *diffuse, nodular and diffuse-nodular (mixed) goiter.*

*Diffuse goiter* is characterized by a uniform enlargement in the absence of nodes.

*Nodular* goiter is characterized by an irregular tumor-like overgrowth of the thyroid gland against the background of the absence of the noticeable enlargement of other parts of the thyroid gland.

*Diffuse-nodular goiter* is diagnosed by nodular growth on the background of the diffuse enlargement of the thyroid gland.

According to the thyroid function, there are *euthyroid (nontoxic, simple), hypothyroid, toxic (hyperthyroid) goiter.*

***According to the WHO recommendations (2001), there are the following grades of the thyroid gland enlargement:***

*Grade 0 -* no goiter (volume of the lobes does not exceed the volume of the distal phalanx of the thumb of the patient);

*Grade I -* the goiter is not visible, but palpable (the size of the lobes is greater than the distal phalanx of the subject's thumb); or there are nodal masses that do not result in an increased volume of the gland;

*Grade II -* the goiter is visible (with the normal position of the neck) and palpable.

*The result of the thyroid gland palpation is influenced by individual anatomical features (the shape of the neck, thickness of muscles and subcutaneous tissue, the position of the thyroid gland*).

Palpation cannot be considered a reliable method of the thyroid gland examination. Its findings must be confirmed by an ultrasound, thyroid scintigraphy (in the case of its retrosternal location).

*Percussion* can find a retrosternal struma (goiter). *Auscultation*. Sounds and murmurs can be heard over the enlarged thyroid in patients with thyrotoxicosis. These are explained by an accelerated flow of the blood and its intensified supply to the thyroid gland.

 **Laboratory and instrumental examination in endocrine system diseases**

 **Study of the thyroid function**

Laboratory study of the thyroid function includes imunnoassay, radioimunnoassay, and radioassay techniques.

*Thyroid hormones.* Thyroxine (*tetraiodothyronine,* T4) contains four iodine atoms. T4 deiodination leads to production of the potent hormone, *triiodothyronine* (T3), or the inactive hormone, *reverse T3*.

Thyroid hormones synthesisis regulated by a classic endocrine feedback loop. Hypothalamic TRH (*thyrotropin-releasing hormone)* stimulates pituitary production of the TSH (*thyroid-stimulating hormone)*, which, in turn, stimulates thyroid hormones synthesis and secretion. Thyroid hormones feed back negatively to inhibit TRH and TSH production.

*Serum T3 and T4 levels are increased in hyperthyroidism and decreased in hypothyroidism*

*Serum thyroid-stimulating hormone (TSH)* is the best test to determine thyroid dysfunction. Normal serum TSH rules out the possibility of the hyperthyroidism or hypothyroidism, with the exception of the hyperthyroidism secondary to a TSH-secreting pituitary adenoma or pituitary resistance to thyroid hormones, and in some patients with central hypothyroidism due to the disease in the hypothalamus and/or pituitary gland.

*Serum thyrotropin-releasing hormone (TRH*) is measured before and after an intravenous injection of 500 mg synthetic TRH. Normally, there is a rapid rise in TSH levels of 5 to 25 mU/l, reaching a peak in 30 min and returning to normal by 120 min. The rise is exaggerated in primary hypothyroidism. Patients with hypothyroidism secondary to a pituitary deficiency have an absent or impaired TSH response to TRH. In hyperthyroidism, TSH release remains suppressed, even in response to injected TRH, because of the inhibitory effect of the elevated free T4 and free T3 on the pituitary thyrotrophic cells.

*Thyroid autoantibodies.* Autoantibodies tothe thyroid peroxidase and, less commonly, to thyroglobulin are present in almost all patients with *autoimmune (Hashimoto's) thyroiditis*, and *thyroid peroxidase autoantibodies* are usually detected in patients with *diffuse toxic goiter* (*Graves' disease*).

*Thyroglobulin.* The thyroid gland is the only source of this iodinated high molecular weight glycoprotein, which is readily detectable in normal patients and is usually elevated in patients with nontoxic and toxic goiter.

*Radioactive iodine uptake (absorption).* Normal accumulation of 131I in the thyroid gland during two hours is 7-12%, and during 24 hours - 20-29%. In patients with hyperthyroidism, these figures are 9.5-72% and 11-89 %, respectively, while in patients with hypothyroidism 1-2% and 2-5 %, respectively.

 **Thyroid gland imaging**

*Ultrasound* is commonly used to visualization of the thyroid gland. It determines the shape, size, location of the thyroid gland, and reveals diffuse and focal (nodules, cysts) abnormalities in the thyroid gland

 ***According to ultrasound measurements, normal volume of the thyroid gland in adults: male - up to 24 cm3, female - up to 18 cm3.***

*Scanning* with radioiodine or technetium-99 determines the shape, size, and location of the thyroid gland, and reveals “warm" and "cold" nodes in the thyroid tissue to determine metastases of tumors.

*X-ray (roentgenography)* can reveal a retrosternal goiter, deposition of the calcium in the thyroid gland, and displacement and compression of the trachea and esophagus by the thyroid gland.

X-ray is used to detect the enlarged *sella turcica* in patients with pituitary adenoma. These is an indirect evidence of the pituitary affection (usually by tumor).

*CT and MRI* can be usedin the diagnosis of theretrosternal goiter, pituitary adenoma and cerebral abnormalities.

 *Fine-needle aspiration biopsy* can determine histopathologic features of the goiter, thyroiditis, and nodules of the thyroid gland.

**Examination of the lymph nodes**

*Normal lymph nodes are not visually detected in healthy adults.* General inspection can find a lymph nodes enlargement by soft-tissue swelling on the neck, in the submandibular, supraclavicular, axillary and inguinal regions. A lymph nodes enlargement of other localization is less frequently revealed during general inspection of patients with certain forms of the leukemia and lymphomas.

**Palpation of the lymph nodes**

***Palpation of the lymph nodes*** offer the opportunityto assess the nodesize, tenderness, consistency, mobility, and fixation to the adjacent tissue.

**Technique of the lymph nodes palpation**

Palpation of the subcutaneous lymph nodes starts with the occipital region.

A patient should stand or sit in a chair with the head slightly tilted forward. A doctor is opposite the patient. The palpation of the lymph nodes is performed by II-d – V-th fingers of both hands.

***Occipital lymph nodes***. The physician’s hands are placed with the fingertips of the right and left hands parallel with the lateral edges of the *musculus occipitalis* (i.e. vertically). The fingers of the left and right hands at the same time feel the space above and below the edge of the occipital bone. The fingers move slowly in a horizontal direction. Normally, these nodes are not palpable. ***Auricular lymph nodes****. Preauricular (anterior auricular) lymph nodes* are palpated with the index and middle fingers, setting them vertically in front of the ear. *Retroauricular (posterior auricular) lymph nodes* palpation is performed by fingers groping behind the ear from the base of the ears and over the entire surface of the *processus mastoideus*. Normally, these lymph nodes are not palpable.

***Submandibular lymph nodes****.* The submandibular lymph nodes are palpated by placing the palmar surfaces of the distal phalanges of the II-d – V-th fingers of the both hands under the left and right parts of the low jaw parallel with its edge. The fingers roll in the direction perpendicular to the inferior edge of the low jaw (Fig. 24. 3).

***Submental lymph nodes*** *are located along the midline under the edge of the low jaw and palpable similarly to* *submandibular lymph nodes.*

***Cervical lymph nodes.***

The cervical lymph nodes are palpable at the anterior and posterior edges of the sternocleidomastoid muscles. ***Supra- and infraclavicular lymph nodes****. Supraclavicular lymph nodes* are palpable above the clavicle. *Infraclavicular (subclavicular) lymph nodes* are palpable in the same way below the anterior edge of the clavicle.

***Axillary lymph nodes****.* Palpation of the axillary lymph nodes begins with the initial abduction of both hands by the patient from the body at 90 degrees, which allows the examiner to bring palms into the patient’s armpits as far as possible. The palpation is conducted by the finger-cushions when they are moved in the superior-inferior and anterior-posterior directions, as well as by rotational movements.

The *central axillary lymph nodes* cite in the middle of the *axillary fossa.* The *lateral axillary lymph nodes* are palpated near the upper part of the humerus with the raised hands.

Then the patient lowers his/her hands a little (to about 45 degrees), which helps to relax the muscles surrounding the armpit, and makes it easier to palpate the regional lymph nodes. The *subscapular lymph nodes* are palpated under the anterior edge of the *musculus latissimus dorsi,* the *mammary (pectoral) lymph nodes* – below the lateral edge of *the musculus pectoralis major.*

***Cubital lymph nodes****.* The cubital lymph nodes cite in the cubital fossa. The patient’s elbow should be bent at the right angle, the muscles are relaxed. The examiner with one hand holds the hand of the patient, and palpates by sliding motions of other hand in the direction transverse to the medial angle of the cubital fossa. ***Inguinal lymph nodes***are palpated in the direction transverse to the *Poupart's (inguinal) ligament*.

***Popliteal lymph nodes***are palpable at the flexed knee in the popliteal fossa.

**Diagnostic value of the lymph nodes examination**

***Lymph nodes are not palpable in healthy adults***. *Excepted from the rule is a single lymph node of the axillary, cervical, submandibular, inguinal groups*, *which are not larger than 1 cm, soft or elastic, painless, removable during palpation, and not fixed to adjacent tissue.*

***Lymphadenopathy*** *is a palpable enlargement (more than 1 cm) of lymph nodes.* There are *localized* *lymphadenopathy* (in only 1 body area) *and generalized* *lymphadenopathy* (in 2 and more body areas). Lymphadenopathy is a pathology of the peripheral immune system due to a variety of infections, malignancy, autoimmune and metabolic disorders.

***Lymphadenitis*** is a lymphadenopathy due to inflammation with characteristic clinical manifestations (e.g., a pain on palpation, fever, local redness and puffiness of the overlying skin).

*Causes of the lymphadenitis* are infectious diseases (bacterial, viral, fungal, protozoal), local soft-tissue infections, and infected wounds. Lymphadenitis can be focal and multifocal.

Focal submandibular lymphadenitiscomplicates infections of the oral cavity and upper airways (e.g., dental caries, tonsillitis).Cervical lymphadenitis may be due toinfections of the oral cavity, upper airways (e.g.; stomatitis, rhinosinusitis, pharyngitis, etc.).Inguinal lymphadenitis develops in inflammatory and infectious processes in the lower extremities and urogenital organs.

Multifocal lymphadenitis may occur in generalized infections (e.g., sepsis, tuberculosis, syphilis, brucellosis, cytomegalovirus infection, toxoplasmosis, HIV infection). Tuberculosis lymphadenitis can suppurate and form fistula.

Clinical manifestations of the lymphadenopathy

|  |  |  |
| --- | --- | --- |
| Variant of the lymphadenopathy | Characteristics | Main causes |
| Lymphadenitis (focal and multifocal) | * pain on palpation of the lymph node(s),
* local redness and puffiness of the overlying skin,
* lympn nodes can suppurate

 and form fistula (in purulent infections, sepsis, tuberculosis),* fever, skin rash, arthralgia may be
 | * infectious diseases (bacterial, viral, fungal, protozoal),
* local soft-tissue infections,
* infected wounds,
* connective tissue systemic diseases
 |
| Localized (noninfectious)lymphadenopathy | * lymph nodes are painless, dense, rough on palpation, painless, dense or often rubbery, matted together lymph nodes
 | * metastasis of the malignant tumor,
* initial presentation of the lymphocytic leukemia, lymphoma
 |
| Generalized (noninfectious)lymphadenopathy | * lymph nodes are painless, rubbery, or often dense, matted together
 | * hemoblastosis(lymphocytic leuke-mia, lymphoma)
 |

***Localized noninfectious lymphadenopathy***is most commonly due to the metastasis of the malignant tumor, and in hematologic malignancy (e.g., during initial presentation of the lymphocytic leukemia, lymphoma). *Characteristics of the lymph node metastasis are painless, dense, rough on palpation, and fixed to* the *adjacent tissues.*

*Lymphadenopathy of the supraclavicular lymph nodes* is a sign of the tumor metastasis from the chest organs, gastrointestinal tract, and lymphoma*. Virchow's node* is an enlarged supraclavicular node on the left with metastasis of the stomach cancer, as well as the pancreas or breast tumors. *Unilateral axillary lymphadenopathy* is a sign of the breast cancer metastasis. *Inguinal lymphadenopathy* occurs in tumor metastases of the pelvic organs (e.g., urogenital system, rectum).

***Generalized lymphadenopathy*** is the most pronounced in hemoblastosis (e.g., acute lymphatic leukemia, chronic lymphocytic leukemia, lymphogranulomatosis). There are painless, dense or often rubbery, matted together lymph nodes. The early-stage disease affects only one group of the lymphatic nodes. The dense lymph nodes can fuse and form a large conglomeration in advanced stages of the lymphogranulomatosis (Hodgkin’s disease) and lymphosarcoma.

*Warning signs of the lymphadenopathy are* a node with a size of more than 2 cm, dense, rough on palpation, fixed to the adjacent tissues; supraclavicular node, combined with fever, weight loss, anemia, a hemorrhagic syndrome, splenomegaly, suspected tuberculosis, HIV-infection, and malignant diseases.

*Diagnostic biopsy of the lymph nodes* is indicated in presence of the warning signs and complicated cases of the lymphadenopathy.

***Lymphomas and leukemids***may be detected at the exposed parts of the body (on the face and/or limbs).

*Leukemids* are changes in the skin due to its infiltration with blast (leukemic) cells in acute leukemia*.* Leukemidsare characterized by multiple and widespread skin induration of the pink or light brown color, elevated above the skin surface, and variably sized from a few millimeters to 2-3 cm. Leukemids are painless on palpation and sometimes with scaly skin.

There are *cutaneous lymphomas* associated with the skin lymphoid infiltration in patients with chronic lymphocytic leukemia*.* These are oval or oblong lumps of the solid-elastic texture, a sensitive to palpation. Unlike lymph nodes, cutaneous lymphomas are tightly adherent to the skin.

**Musculoskeletal system examination.**

 The musculoskeletal system includes the muscles, bones, joints, and soft tissue structures such as tendons and ligaments.

**Muscular system**

Study of muscles includes:

 **-** ***estimation of the shape, volume and consistence of muscles;***

***- detection of pain at palpation;***

 ***- estimation of muscle tone and strength***.

Remember that although muscle wasting may be due to the *primary muscle disease* (e.g. polymyositis), it is more commonly *secondary to disuse*, perhaps because of a painful joint, or to *neuropathy* due to the nerve root compression or peripheral neuropathy.

Muscles may be developed well or weakly, their tone – normal, high or low. They may be painful, often with tonic or clonic convulsions. Welldeveloped muscles present in people engaged in physical labor, sports. Malnourished and seriously ill patients have severe atrophy of muscles. Unilateral muscle atrophy develops after injuries of the limbs, and especially in lesions of the nerves. To detect unilateral muscle atrophy, it is necessary to measure the volume of healthy and affected limbs at the same level in centimeters.

Wasted or atrophic muscles are not only smaller, but softer and more flabby than normal when they are contracted. When muscular wasting is accompanied by fibrosis, as in muscular dystrophy, polymyositis or eosinophilic myositis, the muscles feel hard and inelastic.

Muscular tone refers to the state of muscle tension or contraction. Increased tone is called *hypertonia* and reduced tone *hypotonia.* In *spasticity* tone is increased in proportion to the speed of passive stretch, whereas *rigidity* is an increase in tone at rest. Tone is assessed by taking a limb and moving it passively back and forth at different rates. By giving passive movements to all joints one after another and by palpating the muscles, it is possilbe to determine their tone Important joint tests include pronation and supination at the wrist, and flexion and extension at the elbow and knee.

The strength of the muscles of the arms is examined with the help of dynamometer or asking the patient to squeeze the doctor's hands simultaneously with both hands, and the difference in the strength of their pressure determine the weaker muscles.

In the study of the shoulder flexors, the patient flexes the arm in the elbow joint and holds it, and the doctor tries to straighten it. The strength of the resistance on the affected side will be weaker.

For the study of shoulder extensors, the doctor tries to bend the patient's arm, which is bent in the elbow joint, held by him in this position. The strength of leg muscles is determined in the same way.

*Mid upper arm muscle circumference (MUAMC)* is used to estimate lean body muscle mass. It is derived from the TSF and the midarm circumference, which is measured at the same site as the TSF, with the patient's right arm in a relaxed position. The average midarm circumference (MC) is about 32 ± 5 cm for males and 28 ± 6 cm for females. Mid upper arm muscle circumference is calculated according to the formula:

MUAMC (cm) =MC- (π×TSF).

*Normal mid upper arm muscle circumference is in average is 25.5 cm in male and 23.0 cm in female. Body muscle mass depletion presents if mid upper arm muscle circumference less* *than 15,0 cm in male and less than 14 cm in female.*

**Bones and joints examination**

 *Study of bones and joints includes:*

*-* ***shape assessment of the bones, joints, spine,***

 ***- detection of pain at palpation,***

 ***- estimation of the volume and pain at physiological movements of the joints.***

*Normally, bones and joints have the regular symmetrical shape, the spine - the physiological curves (cervical and lumbar lordosis, thoracic kyphosis).* The skin over them is pale pink, warm to the touch. Active and passive movements of the joints are not restricted in full volume, painless.

 The hands of a healthy person are straight. The hands outstretched with palms turned up touching little fingers do not touch the hands in the region of the elbow. The legs of a normal shape while standing are touching in heels, internal ankles, calves, the entire inner surface of the thighs.

 ***Vertebral column.*** The spine has four physiological curvatures: in the cervical and lumbar parts - convexity forward (cervical and lumbar lordosis), in the thoracic and sacrum parts - convexity back (thoracic kyphosis).

When examining the spine, it is necessary to pay attention to the presence of pathological deformities of it, mobility during flexion and extension, lateral movements, pains of the vertebrae.

 A hump with bulging posteriorly (pathological kyphosis) can develop as a result of rickets, congenital dysplasia of the vertebrae, tuberculosis process. In pathologic curvatures of the spine, lordosis develops anteriorly, scoliosis aside. It is possible a combined lesion – *kyphoscoliosis*

***Bones.*** It is necessary to pay attention to bones shape (curvature, deformation), surface and painfulness. Curvature and deformation of bones occurs as a result of rickets, syphilis, osteomyelitis, and may be a manifestation of such diseases as osteochondrodystrophy, osteochondropathy, poorly consolidated fractures of bones. In patients with blood diseases, pain is noted when tapping in the sternum, ribs, tibia bone. Systemic bone loss is observed in multiple myeloma.

 In chronic diseases of lungs (bronchiectasis, abscesses, tuberculosis), congenital heart diseases, infective endocarditis, the fingers of arms and feet acquire the appearance of "drumsticks" (thickening of the terminal phalanges), while the nails form the *"nail clubbing”*, or *“watch glass*" - *the Pierre-Marie- Bamberger syndrome, or Hippocratic fingers*

**Joints.** Changes in the musculoskeletal system are related primarily to the joints in the clinic of internal diseases. *These are signs of inflammation in joints: pain, local fever, redness, swelling, deformation and dysfunction*.A disease may involve only one joint or a portion of the bone system (spinal tuberculosis). **Active and passive mobility** is examined for evaluation of a jointfunctional state.

To determine the active joint mobility, the patient is asked to perform physiological movements in this joint. To assess passive joint mobility, a doctor sets his arms distal and proximal of the joint and himself performs movements in the joint. In both cases, the volume of movements and its tenderness are estimated.

 *Arthrosis (loss of the articular surfaces of bones)* is characterized by limitation of active and passive movements.Reducing the active mobility only with the preservation of more volume passive movements is observed in arthritis and periarthritis

**Laboratory and instrumental examination in endocrine system diseases**

* 1. *The x-ray* is used to detect [fractures](https://www.stlukes-stl.com/health-content/health-ency-multimedia/1/000001.htm) , tumors, or degenerative conditions of the joint.
	2. *Arthroscopy*is a [minimally invasive](https://en.wikipedia.org/wiki/Minimally_invasive) [surgical procedure](https://en.wikipedia.org/wiki/Surgery) on a [joint](https://en.wikipedia.org/wiki/Joint) in which an examination and sometimes treatment of damage is performed using an arthroscope, an [endoscope](https://en.wikipedia.org/wiki/Endoscope) that is inserted into the joint through a small incision.
	3. *Magnetic resonance imaging (MRI)* is a diagnostic exam that uses a combination of a large magnet, radiofrequencies and a computer to produce detailed images of organs and structures within the body. MRI does not use ionizing radiation. MRI may be used to examine bones, joints, and soft tissues such as cartilage, muscles, and tendons for injuries or the presence of structural abnormalities or certain other conditions, such as tumors, inflammatory disease, congenital abnormalities, osteonecrosis, bone marrow disease, and herniation or degeneration of discs of the spinal cord. MRI may be used to assess the results of corrective orthopedic procedures. Joint deterioration resulting from [arthritis](http://www.hopkinsmedicine.org/healthlibrary/conditions/adult/orthopaedic_disorders/arthritis_85%2Cp00902/)may be monitored by using magnetic resonance imaging.
	4. *Synovial fluid* may be collected by syringe in a procedure termed arthrocentesis, also known as joint aspiration. Synovial fluid may be classified into normal, noninflammatory, inflammatory, septic, and hemorrhagic. Many synovial fluid types are associated with specific diagnoses:
* Noninflammatory
	+ [Osteoarthritis](https://en.wikipedia.org/wiki/Osteoarthritis), [degenerative joint disease](https://en.wikipedia.org/wiki/Degenerative_joint_disease%22%20%5Co%20%22Degenerative%20joint%20disease)
	+ [Rheumatic fever](https://en.wikipedia.org/wiki/Rheumatic_fever)
	+ Chronic [gout](https://en.wikipedia.org/wiki/Gout%22%20%5Co%20%22Gout) or [pseudogout](https://en.wikipedia.org/wiki/Pseudogout%22%20%5Co%20%22Pseudogout)
	+ [Scleroderma](https://en.wikipedia.org/wiki/Scleroderma)
	+ [Polymyositis](https://en.wikipedia.org/wiki/Polymyositis)
	+ [Systemic lupus erythematosus](https://en.wikipedia.org/wiki/Systemic_lupus_erythematosus)
	+ [Erythema nodosum](https://en.wikipedia.org/wiki/Erythema_nodosum)
	+ [Neuropathic arthropathy](https://en.wikipedia.org/wiki/Neuropathic_arthropathy) (with possible hemorrhage)
	+ [Sickle-cell disease](https://en.wikipedia.org/wiki/Sickle-cell_disease)
	+ [Hemochromatosis](https://en.wikipedia.org/wiki/Hemochromatosis)
	+ [Acromegaly](https://en.wikipedia.org/wiki/Acromegaly)
	+ [Amyloidosis](https://en.wikipedia.org/wiki/Amyloidosis)
* Inflammatory
	+ [Rheumatoid arthritis](https://en.wikipedia.org/wiki/Rheumatoid_arthritis)
	+ [Reactive arthritis](https://en.wikipedia.org/wiki/Reactive_arthritis)
	+ [Psoriatic arthritis](https://en.wikipedia.org/wiki/Psoriatic_arthritis)
	+ Acute rheumatic fever
	+ Acute gout
	+ Scleroderma
	+ Polymyositis
	+ Systemic lupus erythematosus
	+ [Ankylosing spondylitis](https://en.wikipedia.org/wiki/Ankylosing_spondylitis)
	+ Inflammatory bowel disease arthritis
	+ [Infection](https://en.wikipedia.org/wiki/Infection) (viral, fungal, bacterial) including [Lyme disease](https://en.wikipedia.org/wiki/Lyme_disease)
	+ Acute [crystal synovitis](https://en.wikipedia.org/wiki/Crystal_synovitis%22%20%5Co%20%22Crystal%20synovitis) (gout)
* Septic
	+ Pyogenic bacterial infection
	+ [Septic arthritis](https://en.wikipedia.org/wiki/Septic_arthritis)
* Hemorrhagic
	+ Trauma
	+ [Tumors](https://en.wikipedia.org/wiki/Tumor)
	+ [Hemophilia](https://en.wikipedia.org/wiki/Hemophilia)/[coagulopathy](https://en.wikipedia.org/wiki/Coagulopathy%22%20%5Co%20%22Coagulopathy)
	+ [Scurvy](https://en.wikipedia.org/wiki/Scurvy)
	+ [Ehlers-Danlos syndrome](https://en.wikipedia.org/wiki/Ehlers-Danlos_syndrome)
	+ Neuropathic arthropathy

Training videos presented in the theoretical section on the course DLS (follow the link)

“Musculo-Skeletal examination” <https://www.youtube.com/watch?v=n6btorvK3V4>

“Lymph nodes examination’’ <https://www.youtube.com/watch?v=WSi42C9Nzv8>

“Palpation of thyroid gland” <https://vk.com/video-117441868_456239024>

**Literature**

**Basic:**

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**Additional:**

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2. Current Medical Diagnosis & Treatment / edited by Maxine A. Papadakis, Stephen J. McPhee, Michael W. Rabow ; associate ed. Kenneth R. McQuaid. - 61st ed. - New York [etc.] : McGraw-Hill, 2022. -– 1840 pp. – 1 экз.

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