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## **PHYSICAL EXAMINATION IN SURGERY**

(textbook for students, teachers, doctors)

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**Physical examination in surgery = Фізикальне обстеження в хірургії :**  
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У навчальному посібнику всебічно висвітлені фізикальні методи дослідження пацієнтів хірургічного профілю, що викладаються на кафедрі загальної хірургії ДДМУ.

Посібник призначається для студентів, лікарів-інтернів, викладачів та практикуючих лікарів-хірургів.

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## PREFACE

Despite significant advances in medicine, the development and application of high-tech innovative methods of diagnosis and treatment, physical examination methods in surgery have not only lost their significance, but also gained new meaning and importance. General clinical methods will not replace computed tomography and magnetic resonance imaging or ultrasound and X-ray examination. The anamnesis of the disease and physical examination of the patient cannot be replaced by any laboratory or instrumental tests. After all, physical methods of examination prioritize and professionally guide the doctor, preparing him/her to solve the complex problems which he/she faces. It must be responsibly noted that the clinical course of the disease was and remains primary.

The book is based on a step-by-step scheme and principles of physical examination of patients in general surgery, based on the analysis of clinical data. This prompted us to systematize and represent the illustrated methods of physical examination of a surgical patient, which should be useful in teaching students, including the preparation for state certification of graduates. The textbook can be visual and useful for surgeons as a reminder of the importance of physical examination of patients in practice. The relevance of this textbook is also dictated by the fact that under the conditions of mostly distance learning the detailed description and sequence of physical examination methods with illustrations, clear and appropriate schematic drawings and their explanations should facilitate the reader's perception, bring him/her closer to the real clinical situation.

The work is based on the data of Juerg Hegglin's book "Surgical Examination" and other similar publications, which are indicated by references in the sources, revised and supplemented by the authors' own clinical experience. The represented work is in the trend of modern standards of higher medical education in Ukraine and highly developed countries.

## EXAMINATION OF A PATIENT

### (Anamnesis)

*Anamnesis* is one of the main methods of determining the disease (diagnosis). A doctor must master very complex and important knowledge, a medical talent and a sense of connection with the patient. Each patient due to his or her individual characteristics, specific conditions (fatigue, annoyance, irritation) needs a special approach and tact. Good mastery of the method of interviewing (examining) the patient comes with experience, practice.

Anamnesis begins with revealing the general data on the patient – a surname, a name, a patronymic. In the future, the patient should be addressed only by name and patronymic. Then the patient's complaints are clarified (in their absence – the reason that prompted the patient to see a doctor; in case of the dispensary examination – qualitative changes are determined). Most often patients complain of pain. Its character is specified (constant, periodic, paroxysmal, amplifying, fading), localization (clear or in what area, whether it is of a different type), irradiation (in the field of the right shoulder blade and the right upper arm at a hepatic colic; downwards, in genitals at a renal colic), intensity (unbearable, strong, dull). Causes of pain – physical exertion, eating, alcohol, hypothermia.

In order not to miss any symptoms, the patient is questioned by the systems: central nervous system (headache, hearing, sight, memory, sleep), endocrine system (irritability, sweating, tearfulness), cardiovascular (shortness of breath, swelling in the legs, heart rate), respiratory (cough, sputum, hemoptysis), digestive (appetite, belching), urinary (urination: accelerated, often at night, its soreness), vascular system of the lower extremities (pain when walking, at rest, edema by the end of the work day). Anamnesis carefully collected in combination with the data obtained from physical, laboratory and special research methods help the doctor to establish the diagnosis.

## **Anamnesis of the disease**

### **(Anamnesis morbi)**

When questioning about the current disease, you need to get answers to the following questions:

1. When did the disease begin (in case of acute illness or injury, indicate the time)?
2. How did it start? What was the cause of the disease, according to the patient.
3. What was the course of the disease?
4. When and where did the patient first seek medical help?
5. Which examinations were conducted, their results?
6. What was the treatment, its effectiveness?

The history of the current disease should reflect its development from the beginning to the present in chronological order.

## **Life history**

### **(anamnesis vitae)**

The factors that could be the cause or the moment of the disease are clarified. The place of birth and residence (endemic goiter, echinococcosis, which is common in Central Asia) are important.

Living conditions in different periods of the patient's life are of great importance (separate apartment, dormitory, sanitary conditions, diet, etc.)

Adverse working conditions and industrial hazards (noise, vibration, cold, high temperature, dust, etc.)

Establish what diseases the patient had before.

Hereditary history: the presence of the same disease in close relatives (hemophilia, varicose veins, polyposis of the colon).

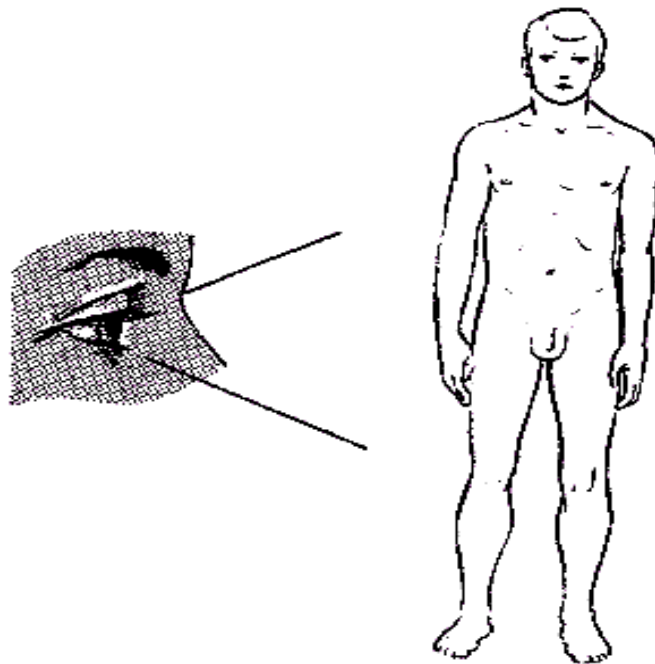
Allergic history of the patient and his/her relatives for medication, food and the development of hay fever.

Bad habits – alcoholism, tobacco smoking, drug use, caused by the overuse of computer technology, audio and video equipment, etc.

## **General examination**

### **(inspectio)**

General examination is carried out under daylight or with fluorescent lamps, which gives the lighting object a white color shade. The examination is performed under lateral and direct illumination in the vertical and horizontal position of the patient, on his back, abdomen, side. It must be systemic. First, a general examination of the whole patient (allows to identify symptoms of general importance), and then – areas of the body; in areas: head, face, neck, torso, limbs, skin, mucous membranes, hair (Fig. 1,2,3). Examination makes possible not only to form a general idea of the patient's condition, but also establish the correct diagnosis "at first sight" (thyrotoxic goiter, hernia, injury).



**Fig. 1. General examination.**

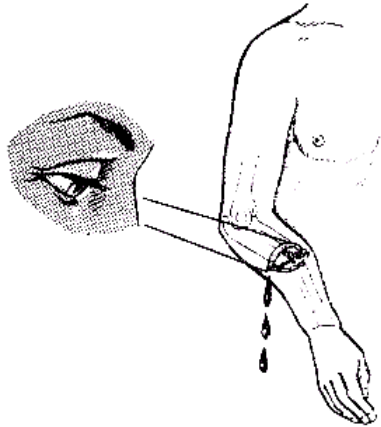


Fig. 2. Local examination.

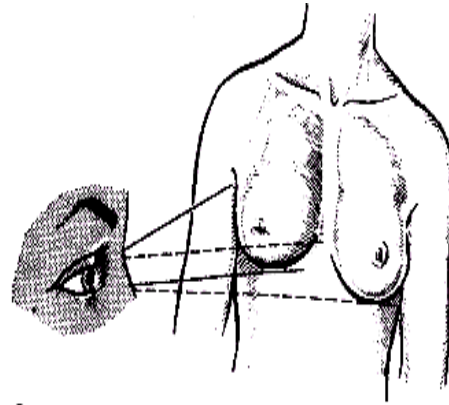


Fig. 3. Comparative examination

**Palpation (palpatio)** is a clinical method of examination by touch to study the physical properties of tissues and organs, the topographic relationship between them, their sensitivity and the detection of certain functional phenomena in the body. The physiological basis of palpation is touch – the sensation that occurs when pressing and moving the fingers, as well as temperature sensation.

According to the method of palpation, there are superficial and deep (an example of the latter is penetrating palpation by pressing the tip of one finger into any point of the body and which serves to detect pain points).

Palpation with one hand is called *one hand palpation* (Fig. 4 and 5).

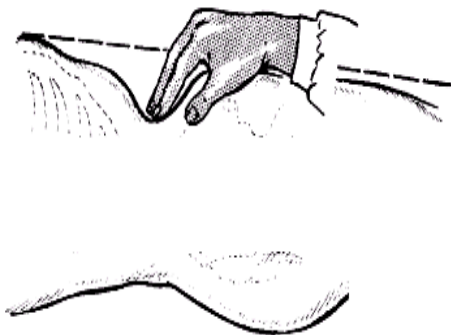


Fig. 4. One-hand palpation.

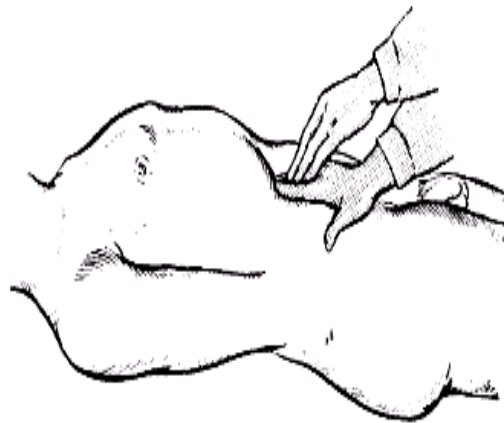


Fig. 5. Palpation by one hand with the help of the other hand.



Palpation with two hands – **bimanual palpation** (Fig. 6) – both hands move towards each other. The organ or the pathological center is located between two hands, thus one hand prevents the shift and at the same time moves the inspected body to the other hand which palpates that body.

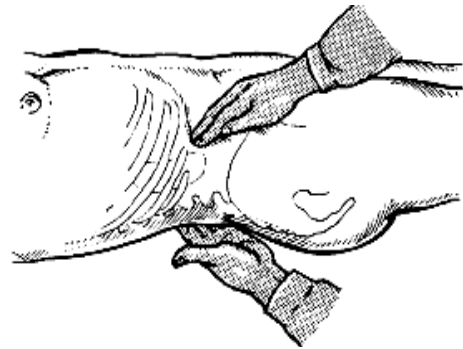


Fig. 6 . **Bimanual palpation**

**Push-shaped palpation** – to detect ballotting of dense bodies (liver, spleen, tumor) in the abdominal cavity with the accumulation of fluid in it, patella – when there is effusion in the knee joint, etc.

Special methods of palpation – **special palpation** – palpation of body openings from the inside (mouth, rectum, vagina) (Fig. 7, 8 and 9).

Palpation of the oral cavity is performed with one or two hands; at examination with one hand, 1-2 fingers are inserted into the oral cavity, while applying back pressure to the outside with the thumb.

Rectal examination is carried out with the index finger worn in a rubber glove with maximum flexion of the other fingers in the metacarpophalangeal joints and removal of the thumb. By pressing the distal heads of the metacarpal bones on the perineum the examiner will be able to move the index finger into the rectum to the maximum distance without violating its palpatory sensitivity. The patient's position depends on the purpose of the examination.

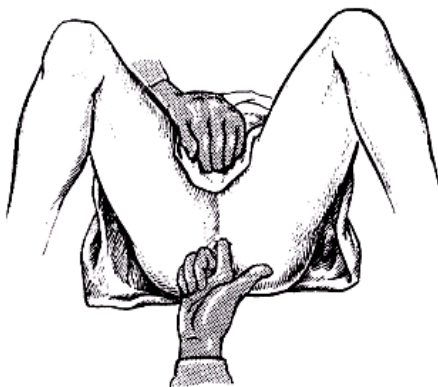


Fig. 7. **Special palpation:** rectal examination.

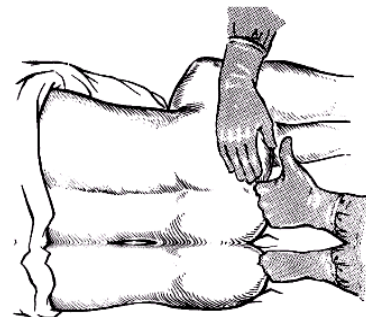


Fig. 8. **Special palpation:** rectal examination on the left side.

The condition of the prostate is best determined in the position of both for stone cutting (Fig. 7), from the mucous membrane of the rectum on the left side with bent knees (Fig. 8), and in the knee-elbow position (Fig. 9). For palpation of the tumor, this study is also performed in a squatting position.

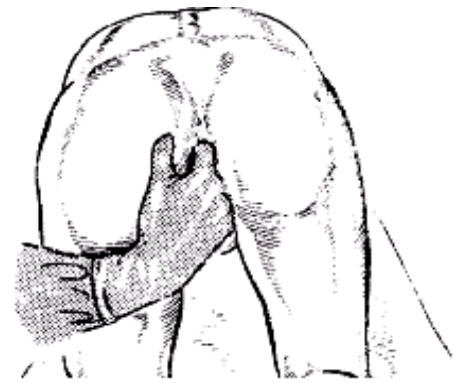


Fig. 9. **Special palpation:** rectal examination in knee-elbow position.

Moreover, developed by V.P.Obraztsov and M.D. Strazhesko, *sliding palpation*, which is used to examine organs in the depths of the abdominal cavity (see “Examination of the abdomen”).

**Percussion (percussio)** - tapping different parts of the body often causes sounds, on the basis of which you can judge the condition of the organs under the place of tapping. The property of percussion sound depends mainly on the amount of air in the body and on the elasticity and resilience of this organ. The sounds received at percussion differ in force: loud (or clear) and quiet (or dull); in height: high and low; by type: tympanic, non-tympanic and sound with a metallic shade. With the help of the *topographic percussion* it is possible to determine the boundaries of organs, their size and shape. Percussion with the purpose of comparing sounds in symmetrical areas of the chest is called *comparative percussion*. In surgery, percussion is used in case of bloating, free movement of fluid in the abdomen.

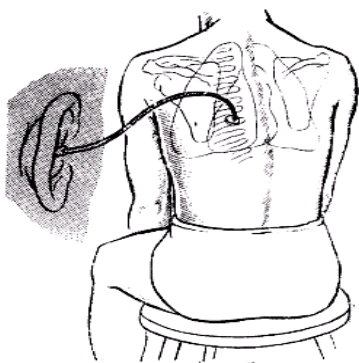


Fig. 10. **Auscultation.**

**Auscultation (auscultatio)** – listening to independently occurring sound phenomena in the body (Fig. 10). In surgery it is used for examining digestive organs (detection of intestinal noises, noise of friction of intestines, noise of narrowing of intestines), joints (noise of friction of an intraarticular surface, a surface of epiphyses), at postoperative pulmonary complications, at vascular diseases.

**Measuring:** heart rate, blood pressure and body temperature should be measured in each patient on admission to the clinic (Fig. 11). Regular weighing of the patient can give valuable data at disturbance of metabolic processes.

For measurements on a skeleton the flexible measuring tape (fig. 12) is used.

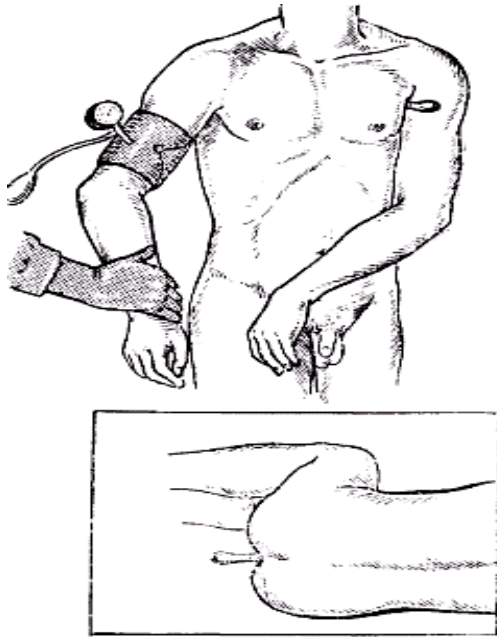


Fig. 11. **Measuring** pulse, blood pressure, body temperature in the armpit and rectum.

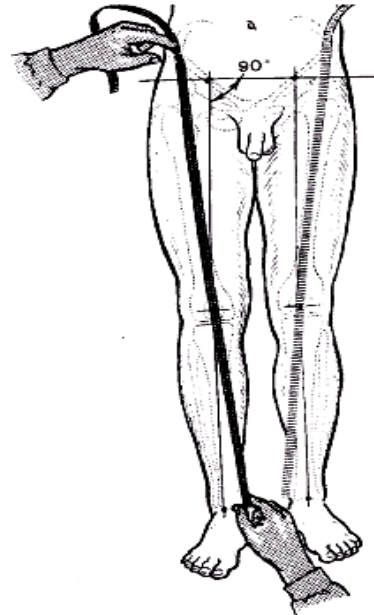


Fig. 12. **Measuring** the length of lower extremities

Bone protrusions, which are felt under the skin, are chosen as reference points. Comparative measurement of paired bones allows doctors to judge the difference in length. The volume of movements in the joints is measured everywhere by the neutral - zero method using a special protractor (Fig. 13).

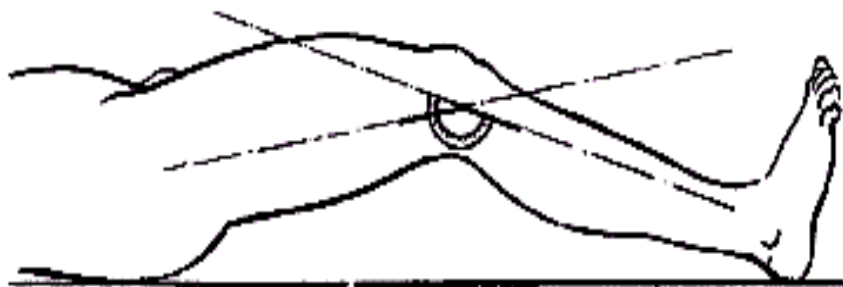


Fig. 13. **Measuring:** measuring the angle.

**Body temperature** is most often measured in the axilla with a thermometer for 10 minutes. Normal temperature - 36.4 - 36.9 °C, subfebrile – 37-38 °C, fever – above 38 °C. Comparative measurement of rectal and axillary temperature may indicate inflammatory disease of the abdominal cavity, especially in the pelvis, if the temperature difference is more than one degree (normally 0.5). A single rise in temperature makes inflammatory disease probable, but says nothing about its nature. A type of the temperature curve for a long time is essential. The expressed fluctuation of temperature with decrease in the mornings, however seldom reaches norm and rises in the evenings – gives the curve a shape similar to teeth of a saw and indicates infectious process (abscess, phlegmon).

This temperature is called *remittent* (Fig. 14). Sudden or intermittent fever is sometimes accompanied by chills (Fig. 15) and it is a consequence of temporary bacteremia (often gram-positive). If the temperature rise occurs naturally, and in the morning it decreases to normal numbers and has a very large difference, it is the intermittent fever (Fig. 16). It occurs in case of septicemia.

The shape-type temperature curve with subfebrile figures (Fig. 17) can be observed in case of chronic inflammation (chronic osteomyelitis), specific infection (tuberculosis), as well as in the postoperative period with a decrease in the body's defense system. It is difficult to distinguish the postoperative fever from such a rise in temperature. The curve has a jagged type, and the absolute figures of the evening temperature without infection decreases day by day.

The cause of fever is considered to be the resorption of hematomas and necrotic tissues, and it is called *resorptive* (Fig. 18). There is a so-called constant temperature (Fig. 19). Constant temperature figures are between 38 and 39 °C without visible decrease in wounds, it can be in case of sepsis, peritonitis, resorption of a big hematoma.

There is a parallelism between the pulse and the temperature curve. The pulse rate increases to the same extent as the temperature rises.

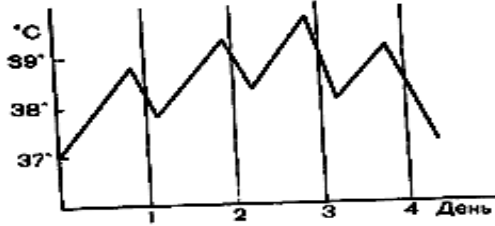


Fig. 14. Temperature curve in case of remittent fever (so-called zigzag curve).

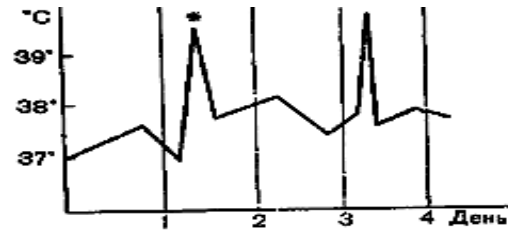


Fig. 15. Temperature curve in case of periodic bacteremia with chills.



Fig. 16. Temperature curve in case of septicemia: intermittent fever.



Fig. 17. Subfebrile temperature in case of chronic inflammation or suppuration.

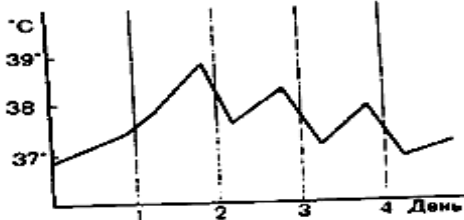


Fig. 18. Post-surgery temperature curve, so-called resorptive fever.

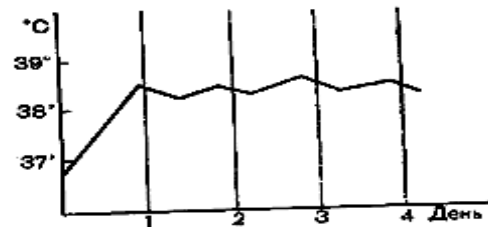


Fig. 19. Temperature curve, indicated as 'constant', it occurs in cases mentioned in the text.

**Concussion – succussion** (splash noise) is manifested in intestinal obstruction, stenosis of the gastric portal (with simultaneous accumulation of gas and fluid). In the position of the patient on his/her back, the doctor shakes the anterior abdominal wall with his/her palm, so that the sound of splashing can be heard (*a positive sign of Sklyarov*).

**Fluctuation** is the movement of fluid inside a confined space in pathological conditions by palpation. In case of the subcutaneous abscess the

fluctuation of pus is typical. Fluctuation is determined bimanually: when you press the finger on the wall of the abscess to the fingers located on the opposite side, it is possible to move the pus and vice versa. Research should be done in different directions so as not to confuse fluctuation with soft tissue pliability.

At a cyst the liquid contents are surrounded by a durable capsule and they are under the increased pressure. It can be moved only together with the capsule; this is denoted by the term 'dense elastic'.

**Diaphanoscopy:** (Fig. 20) a soft tissue is pressed against the cyst wall with a flashlight. If the cyst contains a clear fluid, then in a dark room they will have a reddish color, leaving a print that disappears after 1-2 minutes.

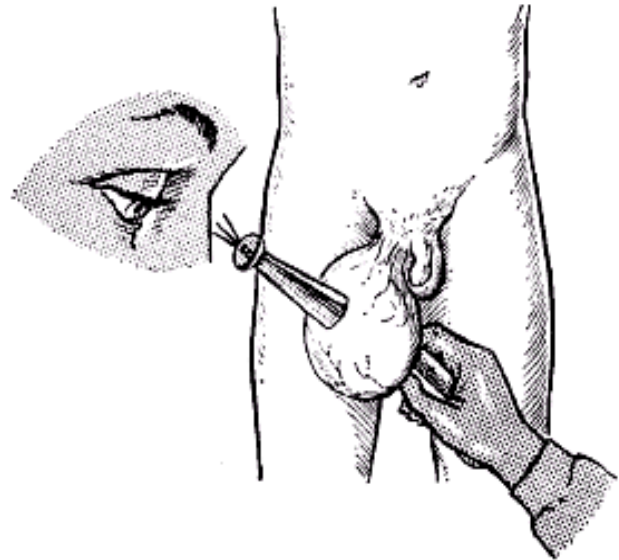


Fig. 20. **Diaphanoscopy – lighting.**

The general condition of the patient is characterized by the following signs: state of consciousness and psyche, position of the patient, body structure, his physique, gait, fatness.

### CONSCIOUSNESS.

There are the following types of consciousness:

1. a state of *clear* consciousness;
2. state of *darkened (unclear)* consciousness - the patient's indifference to his/her condition, answers the question correctly, but with a delay;
3. *Soporosis (sopor)* – a state of numbness: the patient is in a deep sleep. After removing him/her from this state, the question is answered, but the answer is meaningless.
4. *Stupor (stupor)* – or numbness, from which the patient comes out for a while with a loud cry. Reflexes remain (initial stage of acute uremia).

5. **Comatose (Coma)** – unconscious state, complete lack of reaction to external stimuli, lack of reflexes and disorders of vital functions. Coma may occur suddenly or develop gradually. The period before the development of a complete coma is called a **precomatose state**.

**Types of comas:**

**Apoplectic coma** (hemorrhage into the brain) – the face is crimson-red, breathing is slow, deep, loud, bradycardia.

**Hypoglycemic coma** (in case of insulin overdose) – develops rapidly within minutes, sudden feeling of hunger, weakness, sweating, tremors throughout the body, agitation, then pale skin, cramps, dilated pupils, the tone of the eyeballs is not changed. After intravenous administration of hypertonic glucose solution, the patient quickly regains consciousness.

**Diabetic coma** (hyperglycemic) – preceded by severe thirst, polyuria, pain in the underlying area, headache, loss of appetite, the smell of acetone (rotting apples). Then strong nervous excitement, convulsions, Kussmaul's breath appear. The second phase: depression – drowsiness, loss of consciousness. The tone of the eyeballs is reduced, the pupils are narrow.

**Hepatic coma** (in acute and subacute dystrophy or necrosis of the liver parenchyma) – a progressive disturbance of consciousness: first arousal, and then general depression (stupor) to its complete loss (coma). Kussmaul's breath (rarely Cheyne-Stokes respiration). Urinary and fecal incontinence. From the mouth, urine and sweat there is sweet liver odor (excretion of methyl mercaptin). Hemorrhagic diathesis. Jaundice worsens. The liver is enlarged or reduced.

**Uremic coma** (kidney disease) – uremic odor from the mouth (when the residual nitrogen in the blood exceeds 70 mmol/l). The period of severe inhibition is changed by periods of excitement, hallucinations, loud sharp breath with very deep breaths (Kussmaul).

**Alcoholic coma** – a cyanotic face, dilated pupils, shallow breathing, rapid pulse, low, low blood pressure, bad breath.

***Epileptic coma*** – a cyanotic face, clonic and tonic convulsions, tongue bite, involuntary urination and defecation, frequent pulse, eyeballs are set aside, pupils are wide, wheezing.

***Position of the patient*** can be:

1. ***active*** – the patient easily changes his/her position. It can be in the initial stages of even severe untreated diseases. Individual sensitivity to pain and distrust also affect the patient's activity;

2. ***passive*** – an unconscious state and in cases of extreme weakness.

3. ***forced*** – the patient takes actions to relieve or stop the pain (with a perforated gastric ulcer, the patient sits on his/her heels, with a liver injury the patient lies on his/her right side).

**Physique (habitus), constitution** – a set of functional and morphological features of the organism, which are formed on the basis of heritage and acquired properties, and determine their response to the influence of endogenous and exogenous factors (M.V. Chernorutsky). There are three types:

1. ***asthenic*** – dominated by longitudinal dimensions of the body over the transverse, limbs – over the torso, chest, abdomen.

2. ***hypertensive*** – dominated by transverse body size. The torso is relatively long, the limbs are short, the abdomen is large.

3. ***normosthenic*** – proportionality of body structure.

**Posture** is the manner of holding oneself – indicates the general tone, strength, muscle development, as well as the profession and habits. Most physically ill or mentally depressed people are hunched over. Straight posture, brisk gait, free casual movements indicate a good condition of the body.

Specific **gait** is observed in case of some diseases of the nervous system (hemiplegia, sciatica, tabes dorsalis). Surgical diseases of bones and joints, circulatory disorders in the lower extremities change the gait. Characteristic of the so-called 'duck gait' in congenital dysplasia of the articular surfaces, which leads to dislocation when the child gets on his/her feet. At a thrombophlebitis of



hemorrhoidal veins the gait is with the spread legs, patients refuse the offer to sit down.

### **Skin**

It is characterized by color, elasticity, humidity, the presence of various rashes, ulcers, bedsores, scars. Skin color depends on the degree of blood supply to the skin vessels, the quantity and quality of pigment, the thickness and transparency of the skin. **Pale** skin color most often occurs with anemia. In some forms of anemia, pale skin color takes on a typical shade: *earthy* – cancer intoxication; *jaundice* – in case of Addison-Birmer anemia; *greenish* – chlorosis; *ash or brown* – malaria. The reason for the pale color of the skin can also be its low transparency and large thickness. Under these conditions, ‘fictional anemia’ can be in completely healthy people. A blood test will help to understand this. **Red** color – fevers, erysipelas, erythremia, inflammatory skin diseases. **Cyanosis** – caused by hypoxia with circulatory failure, chronic lung disease and others. The **yellow** color of the skin and mucous membranes of different shades is associated with impaired hepatic bilirubin or increased hemolysis (gallstone disease, liver cancer, Botkin’s disease). **Bronze, brown** – anaerobic infection, adrenal insufficiency; **black** – gangrene.

The elasticity of the skin, its turgor is determined by taking the skin (usually the abdominal wall or extensor surface of the hand) in a fold with two fingers. In a normal condition, the skin fold quickly disappears after removing the fingers, and in case of the low tone – it does not straighten for a long time.

Moisture of the skin, excessive sweating is observed in case of thyrotoxicosis, purulent processes. Dry skin occurs in case of a large body fluid loss (pyloric stenosis, frequent vomiting, diarrhea).

In case of hemophilia, sepsis, mechanical jaundice, spotting may appear on the skin (purpura, with allergies – a blistering rash; urticaria – a reaction to penicillin antibiotics).

Exfoliating skin appears after a burn of I - II degree. Postoperative scars indicate the suffered surgeries. In case of cirrhosis of the liver, portal hypertension

– on the skin of the abdomen "jellyfish head" can be determined – portocaval anastomoses.

Excessive **hair** growth can be expressed in case of tumors of the adrenal glands. Decreased hair growth is observed in case of myxedema, liver cirrhosis, on the legs – in case of thromboobliterative diseases.

Dull, thickened and brittle **nails** occur in case of thromboobliterative diseases of the vessels of the lower extremities, myxedema. Nail plates are in the form of a watch glass, and fingers are in the form of drumsticks – in case of long-term purulent diseases, such as bronchiectasis.

### **Subcutaneous fat**

It can be distributed evenly, or its deposition occurs in certain places. By capturing the skin together with the fat in the fold, you can find out the degree of its development. Excessive development of the subcutaneous fat layer – **obesity** can be caused by both *exogenous* (excessive nutrition, sedentary lifestyle) and *endogenous* (dysfunction of the gonads, thyroid gland, pituitary gland) causes. Insufficient development of subcutaneous fat occurs in the asthenic type, malnutrition, dysfunction of the digestive organs. Extreme weight loss (skin and bones) is called **cachexia**. It is observed in case of malignant tumors, diseases of the pituitary gland, thyroid and pancreas.

**Edema** is caused by the release of fluid from the vascular bed into the tissues. When collected, the fluid can be of stagnant (transudate) or inflammatory (exudate) origin, the exact nature of the fluid is determined by laboratory tests. Accumulation of fluid is also observed in the body cavities: abdominal (**ascites**), pleural (**hydrothorax**), in the pericardial cavity (**hydropericardium**), near the testicle (**hydrocephalus**). General swelling that affects the skin, subcutaneous tissue, and other organs and tissues is called **anasarca**. The skin over the swelling seems to be swollen and flaky. Stretched and tense skin with swollen eyelashes, scrotum, where the subcutaneous tissue loose seems transparent. Swelling of the extremities is detected by pressing on the skin on the anterior-inner surface of the

leg. In the presence of edema after removal of the finger there is a hole that disappears after 1-2 minutes.

### Muscles

Muscle atrophy is determined by comparing symmetrically located parts of the body, especially the extremities. It is detected by measuring their circumference and comparing it with the opposite limb. The strength of the hand is determined by the dynamometer or the squeezing of two fingers of the doctor by the patient's right and left hands, as well as the ability to resist the doctor's attempt to bend or unbend the arm at the elbow.

### Lymph nodes

Typically they are not significant and not defined. If you judge the lymph nodes, in addition to examination, it is necessary to use the method of palpation. Attention is paid to the size of the lymph nodes, their pain, mobility, consistency, the connection between them (packages of lymph nodes) and the skin.

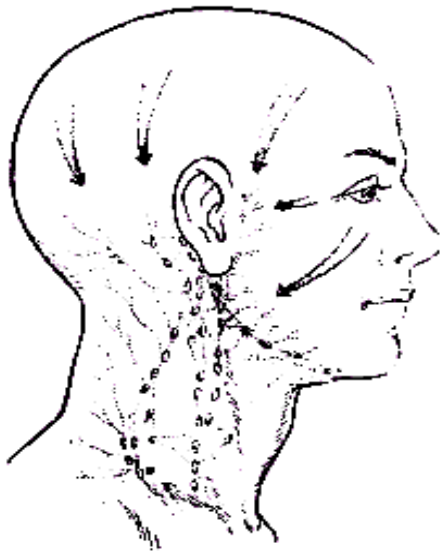


Fig. 21. Outflow of lymph from the head to lymph nodes of the

Submandibular (at inflammatory processes in an oral cavity), cervical, supraorbital, suborbital, inguinal and axillary most often increase. Lymph nodes can be affected primarily (lymphogranulomatosis, lymphosarcoma, leukemia) and secondary malignancies (metastases), purulent-inflammatory diseases (lymphadenitis). The most accurate determination of the nature of lymph node involvement is given by histological examination of them. In the presence of

metastases, the lymph nodes are dense, bumpy, painless. Pain on palpation of the lymph node and redness of the skin indicate an inflammatory process in it. Systemic enlargement of lymph nodes is observed in case of lymphocytic

leukemia, lymphogranulomatosis, lymphosarcoma. The nodes are soldered together and do not fester. Cervical lymph nodes increase in inflammatory and malignant diseases of the head, especially the tongue, mouth, nasopharynx, neck, breast, esophagus and lungs (Fig. 21). The *Verkhovsky* lymph plexus is located between legs of a sternocleidomastoid muscle.

Pathways of lymph outflow into regional lymph nodes (LN) of the breast, taking into account the quadrants (scheme):

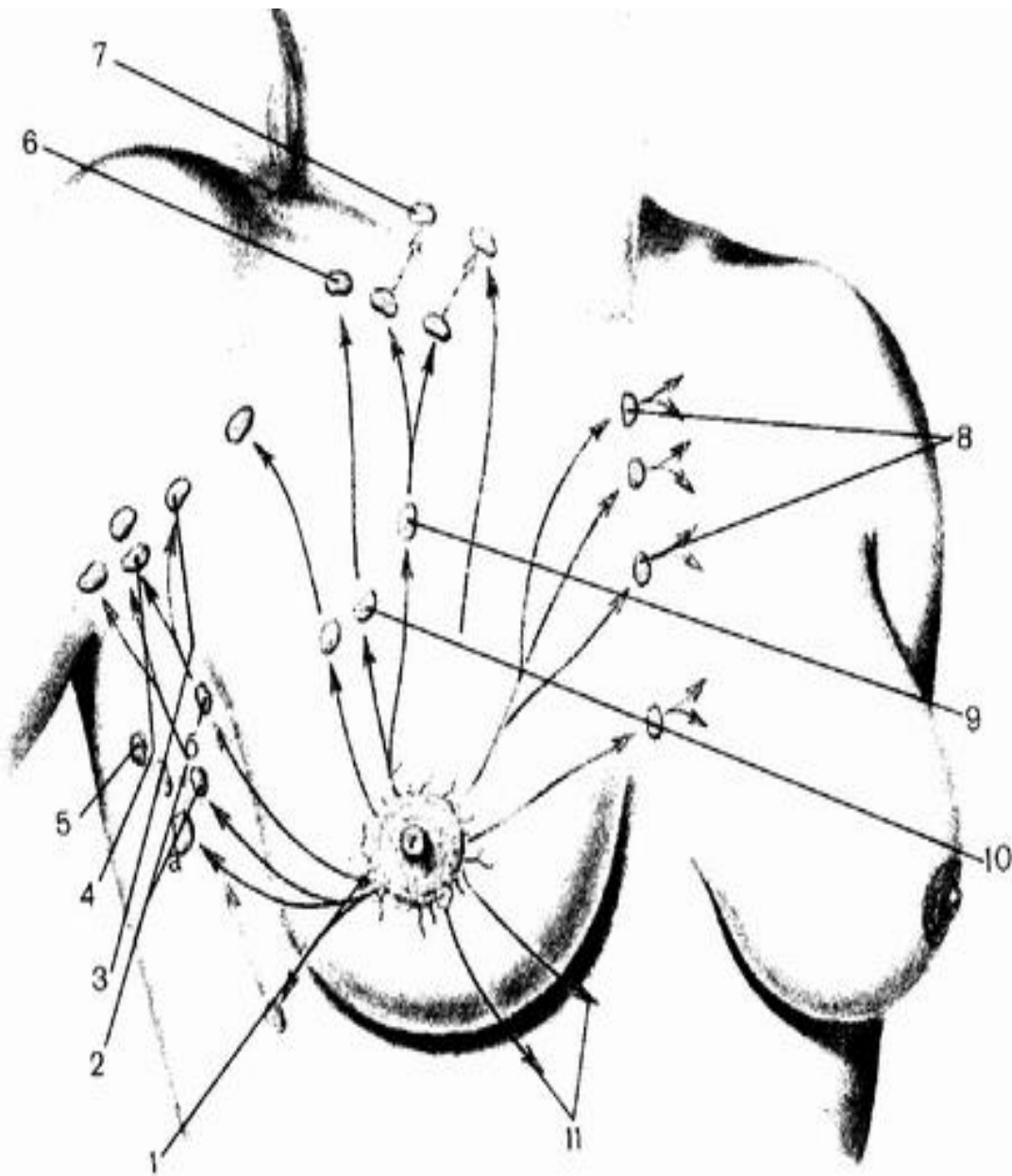


Fig. 22. **Ways of lymph outflow to regional lymph nodes.**  
Explanation can be found in the text.

- 1– near-areola group of LN (Sapel plexus);
- 2 – paramammary LN;
- 3 – Bartel’s node;
- 4 – Sorgius node;
- 5 – laterally-vagina LN;
- 6 – central vagina LN;
- 7 – subscapular LN;
- 8 – subduction LN;
- 9 – overduction LN;
- 10 – parasternal LN;
- 11 – extra thoracic LN;
- 12 – inter thoracic LN (Rother's node);
- 13 – lymphatic vessels directed to the epigastric region.

In this area cancer of the stomach, esophagus, breast, lung, pancreas metastasize. Subductal lymph nodes collect lymph from the chest, upper extremities, and partially the neck; lymph nodes of the inguinal cavity – from the upper extremities, chest, breast, upper abdomen and back. In case of a breast cancer on edge of a large pectoral muscle there can be metastasises in *nodes of Bartels and Sorgius* (Fig. 22).

Elbow lymph nodes collect lymph from the forearm and hand and are located in the inner part of the biceps. The arm should be bent at the elbow at a right angle. Inguinal lymph nodes collect lymph from the anterior abdominal wall, buttocks, perineum, anus, lumbar region, and external genitalia. They are located along the course of the pupart ligament. In the scarp triangle there are femoral lymph nodes that receive lymph from the lower extremities.

In the femoral canal there is a *lymph node of Resenmüller-Pirogov*. In case of its suppuration sometimes the strangulated femoral hernia is mistakenly diagnosed.

At general examination it is necessary, first of all, to pay attention to open parts of a body of the patient – a head, a neck, the face.

### Head

It can be of various shapes: *brachiocephalic* (with relatively large transverse dimensions) and *dolichocephalic* (with relatively large longitudinal dimensions). There are ugly forms of the head – *a tower skull* (one of the symptoms of general degeneration), *microcephaly* (head of abnormally small size - observed simultaneously with mental retardation).

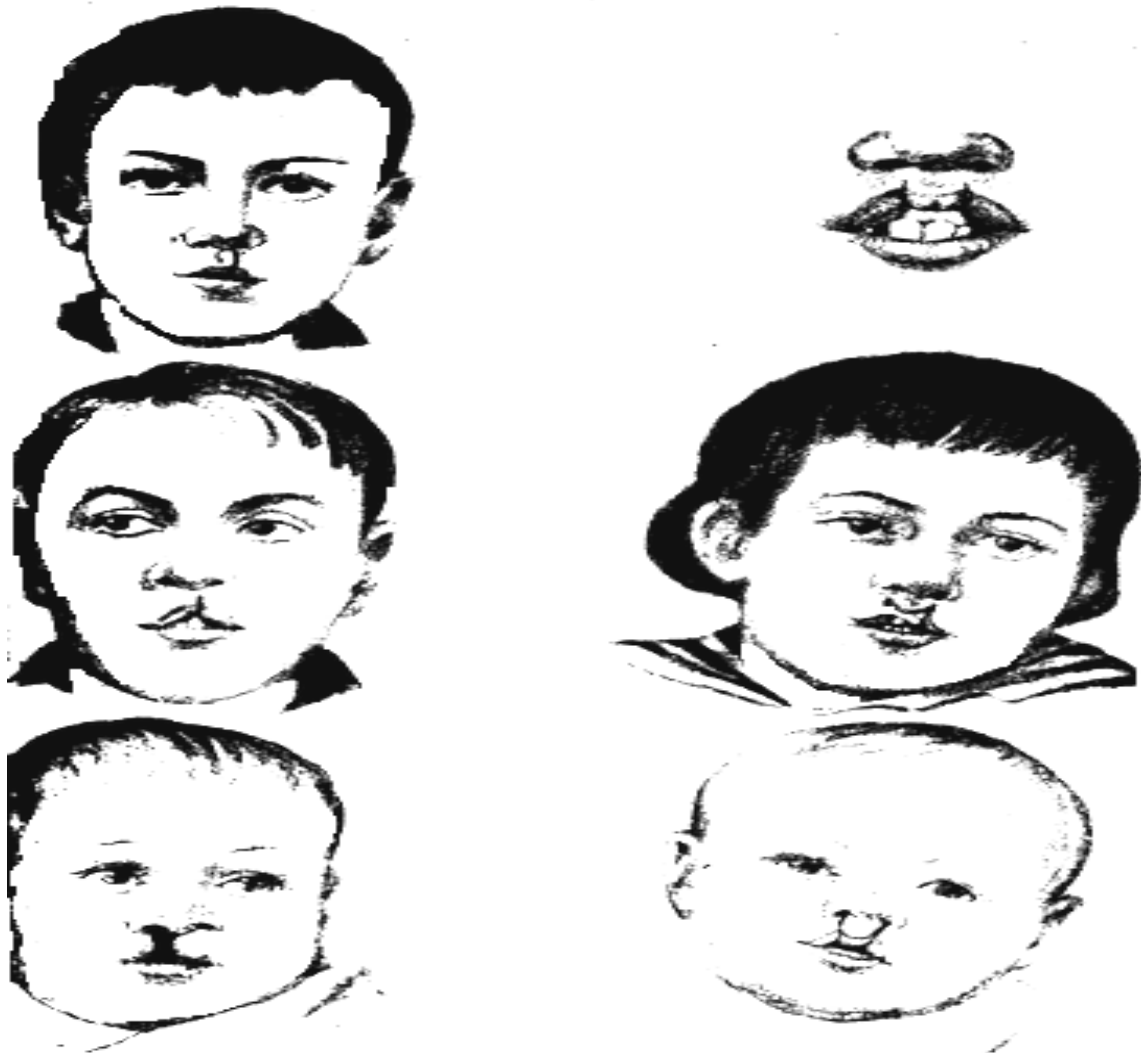


Fig. 23. Different typical forms of congenital cleft lip and concomitant disorders of the shape of the wing and tip of the nose.

The normal shape of the head has a normal ratio between the front and hair of its parts 1: 2. Excessive increase in the size of the skull occurs in the so-called hydrocephalus.

- Examination can reveal the following malformations: lateral clefts of the upper lip (Fig. 23); oblique and transverse clefts of the face; hypertrophy of the tissue of the lips and eyelashes; inflammatory diseases of soft tissues – boils, carbuncles, erysipelas.

- **Boils and carbuncles** on the face, especially on the upper lip and wings of the nose, sometimes become malignant can lead to thrombophlebitis of the veins of the face, which in the presence of anastomoses leads to thrombosis of the cavernous sinuses, purulent meningitis;

- **erysipeloid** of the face and head begins with sudden chills, fever up to 39-40 °C. On the skin of the face, usually around the wings of the nose there is a 'butterfly figure' with a center of redness with sharply delineated borders. On the head the most important diagnostic sign is sharply outlined hyperemia of the skin – often masked by hair;

- **chronic inflammatory processes**: actinomycosis of the face and neck, lupus (one of the types of tuberculous lesions of the skin), syphilis, leprosy;

- **soft tissue neoplasms** (benign): atheromas, teratomas, fibroids, skin horn

(brown or black papillomas of the face), rhinophyma (bumpy, often at the tip of the nose), hemangioma, lymphangioma (simple, cavernous and vesical, pigmented plaque;



- malignant **neoplasms**: cancer of the skull, facial skin cancer, lower lip cancer

Fig. 24. Cancerous ulcer of the lower lip.

(Fig. 24). There are independent (active) and provoked passive)

mobility of the tumor.

Deformation of the head occurs after a fracture of the skull.

**Skull damage.** Careful examination and palpation of the head reveal the features and location of head injuries (from scratches and hemorrhages to deep and large wounds with bone fractures and external bleeding from the nose and ears).

*A fracture of the skull* is always a moderate injury. As a result of the action of mechanical energy, not only the bones are damaged, but also most of the membranes and the substance of the brain are affected (bruise, possible intracranial hematomas). Depending on the damage to the dura mater, there are *non-penetrating* fractures (the membrane remains intact) and *penetrating* (with bone damage, the membrane ruptures). Arc fractures are *complete* when all layers of bone are damaged, and *incomplete* – only the structure of the outer or inner plate of the bone is broken. Of the complete fractures – *linear, fragmentary and depressed*.

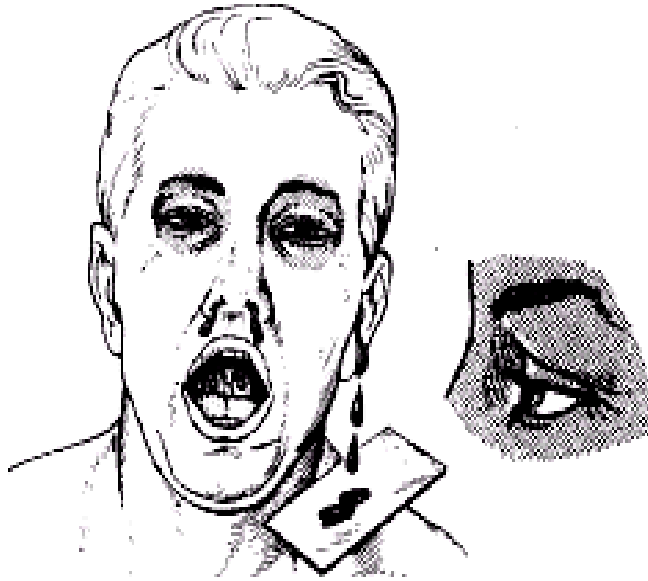
In the clinical picture of depressed fractures there are symptoms of contusion of the brain. Monoparesis or monoplegia is often present due to damage to a small area of the brain. Along with the focal symptoms that are caused by brain contusion, there are signs of brain compression. They are sometimes layered on the symptoms of severe brain contusion or appear after a ‘light interval’. Then there are usually general cerebral symptoms: headache, vomiting, psychomotor agitation, disturbance of consciousness. They are joined by stem injury. The gradual deterioration of the patient’s condition is associated not so much with the compression of the brain by bone fragments, but with the development of cerebral edema and its dislocation.

At a fracture of an arch of a skull the roentgenogram in two projections has great value.

*Fracture of the skull base* is always a dangerous (minimum of moderate) trauma, manifested by relatively severe clinical symptoms. The main ones are:

hemorrhages in the soft tissues of the orbit (symptom of the eyepiece, or ocular hematoma) and over the tactile process (Fig. 25);

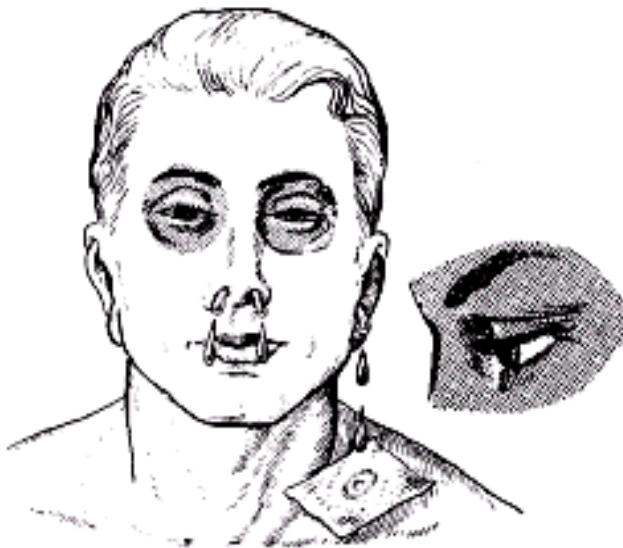




**Fig. 25. Hemorrhages in the soft tissues of the orbit and over the tactile processus.**

slaughter of the basal parts of the brain; meningeal signs.

In order for the diagnosis to be more accurate, it is better to consider several symptoms. The first two signs are symptoms of a fracture of the skull base, except



**Fig. 26. Liquorrhea from the nose and ears.**

for local soft tissue damage, and hemorrhages appear a few hours or 2-3 days after the injury. Based on the fact of cerebrospinal fluid, you can confidently diagnose: a fracture of the skull base. To differentiate cerebrospinal fluid from blood, use a sample of light corolla around the blood spot on a gauze napkin: with cerebrospinal fluid in the center of the blood

drop, a light spot is formed, and with pure bleeding it will not be (Fig. 26).  
*A fracture of the pyramid of the temporal bone* usually leads to bleeding from the ear. Transverse fracture of the pyramid of the temporal bone is diagnosed

bleeding from the nose, mouth, ears or accumulation of blood in the middle ear - hematotympanum;

cerebrospinal fluid from the nose, mouth, ears, pneumocele or pneumocephaly, loss of cranial nerve function;

signs of damage to the arteries (internal carotid or middle meninges), sinuses of the base of the brain;

general cerebral and focal signs of

most often on the basis of hearing impairment. Therefore, a mandatory hearing test should be carried out separately for both ears. Fracture with simultaneous damage to the dura mater and under the arachnoid space, when the fracture passes through the airways and it causes cerebrospinal fluid, which is recognized by the flow of serous or slightly stained blood from the nose or ear. Leakage of cerebrospinal fluid is most often observed 2-3 hours after injury or later.

Most often these are linear fractures. Fracture of the skull base in some cases is easier to recognize clinically than radiologically.

The clinical picture is characterized by signs of intracranial hypotension: constant headache, exacerbated by getting up, nausea and sometimes vomiting, vestibular disorders, lethargy. These symptoms in the patient decrease in a horizontal position.

*Loss of cranial nerve function* is an important sign of fractures of the skull base. The olfactory function is most often impaired as a result of a fracture of the perforated plate, facial – when the pyramid of the temporal bone is injured (Fig. 27), oculomotor (III, IV, VI) nerves – when the orbit is injured. More exceptionally, the optic nerve is injured – the optic nerve canal is injured, the trigeminal nerve is injured – the hole at the base of the middle cranial fossa is injured (Fig. 28) and the sublingual – the canal of the eponymous nerve is injured.



**Fig. 27. Peripheral paralysis of the facial**



**Fig. 28. Trigeminal neuralgia.**

**Dislocation of the mandible** (Fig. 29) can be diagnosed at first glance: the patient's mouth is half open, the skewed corner of the mouth on the patient's side is removed forward and downward. The mouth cannot be closed.

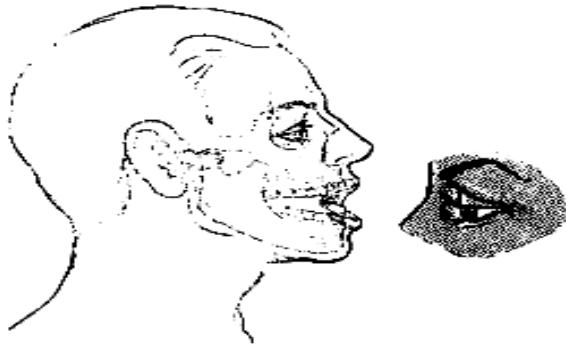


Fig. 29. Dislocation of the lower jaw.

**Facial skull injuries** can be quickly diagnosed using the techniques presented in Fig. 30, 31.



Fig. 30. **Techniques for diagnosing fractures of the facial skull:** a - palpation of the alveolar-zygomatic ridge; b - pathological mobility in the area of the front teeth; c - pathological mobility in the area of the front teeth of the fronto-zygomatic suture (Le Fort Sh); d - pathological mobility in the area of the front teeth and the base of the orbit. When the bottom of the orbit is compressed, there may be a loss of sensitivity due to compression of the inferior optic nerve.

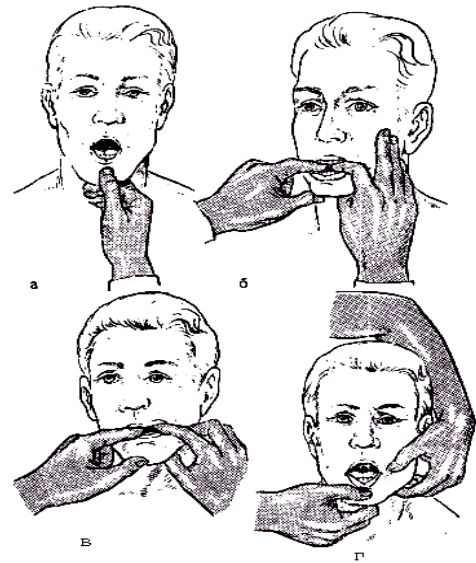


Fig. 31. **Techniques for the diagnosis of mandibular fractures:** a - temporary pain; b, c - pathological mobility in the area of the front teeth; d - pathological mobility of the angle of the mandible.

**Brain injuries.** The diagnosis of traumatic brain injury (traumatic brain injury) and its severity must be established within a few hours, and in case of a serious condition of the patient – urgently. At the initial examination it is necessary to examine the whole body of the patient, paying attention to skin color, scratches and hemorrhages, in order to identify possible damage to the chest and abdomen, spine and limb bones. It is necessary to identify the degree of filling of the bladder. Visually examine urine, which is clear, impure or mixed with blood. After that, it is possible to note active movements of the limbs or their disappearance, clarify what caused the restrictions on movement – brain damage or limb damage.

Establish disturbances of consciousness (according to the Glasgow scale), the state of vital functions (frequency and sufficiency of respiration, pulse, blood pressure), identify general cerebral symptoms (headache, nausea, vomiting) and focal disorders – changes in size of a pupil, reaction to light, signs of facial nerve damage, paresis of the extremities, as well as signs of damage to the brainstem (nystagmus, floating movements of the eyeballs, changes in tone in the extremities), meningeal symptoms, epileptic seizures.

Clinical forms of acute trauma include concussion, contusion, diffuse axonal rupture and head compression.

**Concussion (*commotio cerebri*)** is the most common and least severe form of the closed brain injury. To diagnose it is important to establish the fact of head injury. Short-term retro-, con- or anterograde amnesia is typical. *Retrograde amnesia* is the loss of memory immediately before losing consciousness. *Congenital amnesia* is a memory impairment of events that occurred directly during the period of impaired consciousness. *Anterograde amnesia* is the loss of memory for events after regaining consciousness. Patients complain of headache, dizziness, weakness, tinnitus, soreness of eye movements. Autonomic disorders are typical. Subjective disorders predominate: dry mouth, feeling of blood flow to the head, feeling of heat or chills, sweating, instability of blood pressure, pale skin, orthostatic reactions, odor intolerance, sleep disturbances, chest discomfort, palpitations, memory impairment.

Focal neurological and meningeal symptoms are not defined. Often it is put only on the basis of the anamnesis.

*The contusion of the brain (contusio cerebri)* is based on organic damage to the brain substance from small in size in the dumb area to large destructions involving vital centers. Symptoms depend more on the location of bruises than on the number of injuries. Loss of consciousness and amnesia come to the fore. In contrast to concussion, the contusion is accompanied by a deeper and longer loss of consciousness. *Mild contusion* is a loss of consciousness from several minutes to one hour, headache is more intense and prolonged, repeated vomiting. Weak or moderate regressive focal neurological disorders are typical. Meningeal syndrome is noted. *Moderate contusion* is a loss of consciousness for several (4-6) hours. Sometimes the patient has transient brady- or tachycardia, increased blood pressure, tachypnea, subfebrile fever, as well as stem reflexes: nystagmus, dissociation of tone, reflexes along the axis of the body. *Severe contusion* – the patient is in a coma for several hours to weeks. Coma may alternate with motor excitation. Vital functions are impaired (changes in the frequency and rhythm of respiration, heart activity), initially there are stem symptoms (multiple nystagmus, strabismus, floating movements of the eyeballs, miosis, mydriasis), changes in muscle tone, rigidity, hyperthermia, convulsions. The meningism found at examination can cause suspicion of the presence of blood in cerebrospinal fluid (rigidity of occipital muscles in the sagittal plane). Rigidity when turning the head indicates damage to the cervical spine! Among the neurological signs the first place are hemiparesis on the opposite side (spastic or flaccid paralysis on the side opposite to brain injury) and aphasia. A major contusion is often accompanied by a positive Babinski sign on the opposite side, which is the most important sign of the damage to the leading pyramidal pathways. In case of a contusion of a brainstem the positive sign of Babinsky on both sides is typical, that is an unfavorable prognostic sign. The contusion of the cortex of the large hemispheres leads primarily to the development of focal symptoms, and the contusion of the base of the brain – to the loss of function. The contusion of the brain stem in the area of

the posterior fossa is the most serious injury. The patient has a deep loss of consciousness, wide, unresponsive pupils, tonic convulsions, bilateral positive Babinsky sign, Cheyne-Stokes respiration and the initial rise in blood pressure occurs immediately before respiratory arrest and cardiac arrest. Complete loss of function of the cerebral cortex is called *decortication*.

***Diffuse axonal damage to the brain*** – multiple ruptures of axons in the white matter, corpus callosum and trunk formations. Clinical manifestations – deep and prolonged coma with the phenomenon of decortication or decerebration and muscle tone disorders; stem symptoms (paresis of the gaze, violation of the corneal reflex, pupils); motor disorders are often manifested by tetraparesis with extra pyramidal features. Major disorders of autonomic (hyperthermia, hyperhidrosis) and vital functions (respiration, cardiovascular activity) are evident.

In each case of traumatic brain injury, dynamic monitoring is of great importance. The patient's condition may deteriorate suddenly as a result of bleeding or post-traumatic brain edema.





Реакция на свет	Расширение	Расширение	на свет
+	—		+
+	—		+
+	+		—
—	++		—

Fig. 32. Examination of the pupils and their reaction to light in case of the intracranial hematoma.

Due to the increasing compression on the left side, they successively pass 4 stages from normal reaction (top) to death (bottom).

Deterioration of consciousness indicates an intracranial complication. In the state of consciousness there are no reaction to treatment – *somnolence* (the patient is lethargic, but he/she can be awakened), *sopor* (reaction to painful irritation remains) and *coma* (lack of reflexes).

Particular attention in dynamic observation is paid to the pupils, which are checked for dilation, separate and friendly response to light (Fig. 32). If the pupil on the opposite side from the injury does not react during illumination and remains wide, then there is a damage to the optic nerve. At more frequent paralysis of an oculomotor nerve pupils react to light and expand separately from each other. Pupil dilation occurs on the side of the brain injury. Often the brain is damaged by the opposite blow. In case of increasing dilation of the pupil, it loses its response to light, bilateral dilation of the pupils with no reaction to light occurs shortly before the death of the brain. Contusion of the brain (compression cerebri) is characterized by a clear gap. After the disappearance or smoothing of the initial

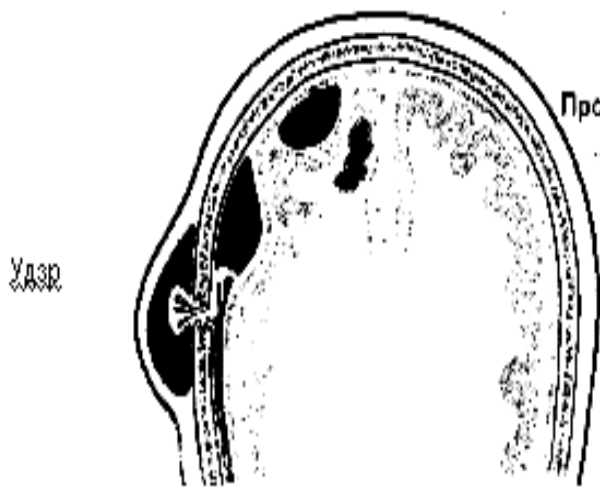


Fig. 33. **Intracranial hematoma.** Left: breaking the skull. Subpneurotic and epidural hematomas. Above: subdural and intracerebral hematomas (contusion). Damage is more often located from the side opposite to the action of force (shock) than from the direct application of force (impact).

symptoms of the injury, there is again a deterioration of consciousness, neurological disorders due to increased intracranial pressure.

**Epidural hematoma** occurs as a result of damage to the middle sheath artery in skull fractures. The clear interval is short (a few hours). Neurological prolapse on the opposite side, and later – dilation of the pupil indicates the localization of the process (Fig. 32, 33). **Subdural hematoma** can occur acutely as a result of bleeding in the area of the bruise or rupture of the vessels of the dura mater.

The loss of consciousness which it causes follows immediately after the initial loss of consciousness without a clear interval. Suspicion of it is caused by the deterioration of the condition during care.

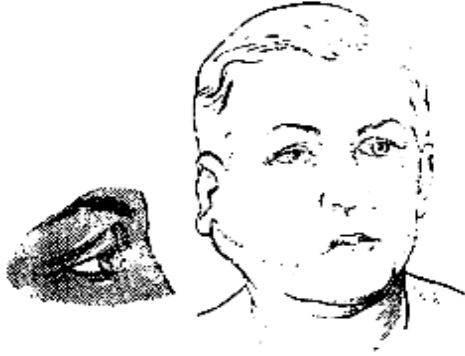


Fig. 34. **Mixed tumor of the parotid gland** (mumps).

*Chronic subdural hematoma* is manifested in weeks and months by symptoms of increased intracranial pressure, which increases slowly (headache, mental changes). Schematically, a quick resolution of symptoms (for a while) indicates a concussion. Constant, long-term existence of symptoms or slow reversal of development – about concussion, and the growth of symptoms – about increased intracranial pressure (intracranial hematoma, cerebral edema).

**Mumps (parotitis)** is an increase in the parotid gland in front and under the auricle, in the fossa between the corner of the esophagus and the papillary sprout, which most often protrudes from the earlobe (Fig. 34). If the middle main branch of the facial nerve, which breaks through the parotid gland, is involved in the pathological process, the corner of the mouth is lowered. If all branches of the facial nerve are affected, then its peripheral paralysis develops.

### **Face expression**

It can be friendly, smiling, sad, indifferent, contemptuous, angry, irritated. In addition to various pathological and somatic conditions, it is influenced by age and sex. The following changes on the part of the face are of a diagnostic value:

1. *swollen face* is observed in diseases of kidneys, as a result of venous stasis with frequent attacks of asphyxia and cough, in case of compression of the lymphatic system in mediastinal tumors, compression of the superior vena cava;



2. **fever face** – redness of the skin, shining eyes, excited expression. In case of infectious diseases it has some features: in lobar pneumonia, the blush is more pronounced on the side of the inflammatory process in the lungs; typhus rash – general redness of the swollen face, ‘rabbit eyes’; typhoid fever – pale complexion; the reverse is yellowish; in patients with tuberculosis ‘shiny eyes’, on the emaciated pale face limited blush on the cheeks; with septic fever – sedentary, pale, sometimes with mild jaundice;

3. **risus sardonicus (cardonic laughter)** – the mouth expands, as in laughter, and the forehead forms folds, as in the sum, observed during editing;

4. **Facies Hypocratica** – eyes are swollen, pointed nose, dead-pale with a bluish tinge to the face, sometimes covered with large drops of sweat. It occurs in diffuse purulent peritonitis, sepsis;

5. with various endocrine disorders: a) **myxedematous face** – accompanied by decreased thyroid function: evenly swollen eye slits with mucosal edema are reduced, facial contours are smooth, hair on the outer halves of the eyebrows is absent, inflamed eyeball (enophthalmos), the presence of blush on a pale background resembles a doll's face; b) **basal face** – accompanies hyperfunction of the thyroid gland – mobile, evenly dilated both slits, bulging, expression of fear, anger; c) **acromegalic face** – enlargement of those parts of the face that protrude (nose, chin, cheekbones). Occurs in patients with acromegaly, as well as in some pregnant women; d) **intense red, moon-shaped**, shiny, with the development of beards and mustaches in women with Itsenko-Cushing's disease;

6. **'Parkinson's mask'** – a mimic face typical for patients with encephalitis. **Suffering** expression occurs in case of severe pain.

### Examination of eyes and eyelids

It gives the possibility to identify a number of important symptoms. Anamnesis sometimes makes it possible to make a preliminary diagnosis. Complaints of gluing of the eyelids in the morning are very typical for acute conjunctivitis, the feeling of ‘loose sand’ behind the eyelids – for chronic

conjunctivitis. Sometimes complaints are focused on the localization of the impression: simultaneous blepharospasm (closing of the eyelids), tearing, photophobia – it indicates a disease of the cornea. At examination of the fabrics surrounding an eye, it is necessary to pay attention to the form and arrangement of eyelids, color of skin and a condition of their edges, the form and the sizes of an eye slit.

**Swelling of the eyelids** ("bags under the eyes") are the first signs of kidney pathology; swelling of the eyelids is observed in case of anemia, frequent coughing, insomnia, and sometimes in the morning and in healthy people. Edema of eyelids can be inflammatory and non-inflammatory (always bilateral, vitreous). **Sty** is an acute limited purulent inflammation of the edge of the eyelid (a consequence of infection of the hair follicle or sebaceous gland). Sharp painful swelling on the edge of the eyelid. After 2-4 days, a yellow head is formed on its top, after the opening of which the secretion of pus and particles of necrotized tissue. **Blepharitis** – inflammation of the edges of the eyelids. It can be *simple* or *scaly* – the edges of the eyelids are slightly hyperemic, sometimes slightly thickened, covered with small grayish-white scales, itching; ulcerative blepharitis is characterized by the formation of purulent crusts on the edge of the eyelid, after removal of which bleeding ulcers are exposed. Their scarring leads to eyelash loss, improper growth; *meibomian blepharitis* – edges of the eyelids are hyperemic, thickened, they seem oily. When pressed on the cartilage, an oily secretion is released.

Dark staining of the eyelids occurs in case of Graves' disease and Addison's disease; the presence of xanthoma – in case of disorders of cholesterol metabolism.

**Scarring of the eyelids** is formed due to the tightening of the skin of the eyelids after injuries, burns, lupus, etc.; **spastic inversion of the eyelid** occurs as a result of contraction of the orbital part of the circular muscle of the eye; **senile eyelid twist** – a consequence of the weakness of this muscle; **paralytic inversion** occurs only in the lower eyelid and occurs due to paralysis of the facial nerve. The

edge of the eyelid at a distance from the eye or turned down, causing the mucous membrane to turn outward. It gradually dries out and hypertrophies. Together with the eyelid, a mucous point leaves the eye, which leads to tearing and maceration of the skin. Keratitis can develop from not closing the eyelids.

**Keratitis** – inflammation of the cornea of the eye, it is accompanied by pain, photophobia, lacrimation, blepharospasm, impaired corneal transparency, it forms limited or diffuse infiltrates. The cornea becomes dull, dull, rough. In its tissue vessels often develop – superficial, coming from the conjunctiva, and deep, epi- or scleral origin. The sensitivity of the cornea is reduced or absent. After resorption of infiltrates stable turbidities of various intensity are formed. The formation of corneal ulcers is possible.

**Acute conjunctivitis** (inflammation of the conjunctiva of the eye) – a feeling of tingling in the eyes, photophobia, tearing, swelling of the eyelids, swelling and redness of the conjunctiva, mucopurulent waste. Blenorrheal conjunctivitis is characterized by initially serous-bloody, and after 3-4 days abundant purulent waste. **Chronic conjunctivitis** – itching, burning, feeling of ‘sand behind the eyelids’, photophobia, eye fatigue. Looseness, mild swelling, conjunctival hyperemia, scanty mucopurulent wastes. The course of the disease is very long. **Spring catarrh** (spring conjunctivitis) is a chronic inflammation of the conjunctiva of the eyelids and eyeball, which worsens in the spring-autumn period. The main role is played by allergens, endocrine disorders, ultraviolet radiation.

**Strabismus** is the deviation of the visual axis of one of the eyes from the general point of fixation. There are *paralytic strabismus* (caused by damage to the nerves innervating the muscles of the eye) and *concomitant strabismus* (which can be caused by CNS diseases, general infections and intoxications, a sharp decrease in vision or blindness in one eye, mental trauma). Common strabismus most often develops in childhood. The visual axis of one eye is deviated from the object fixed by the other eye. Doubling usually does not occur. Binocular vision is absent. Both eyes (fixing and oblique) perform movements in approximately the same amount. These movements are not limited in all directions. Sight of the slanted eye is

significantly reduced. Paralytic strabismus differs from concomitant diplopia by the absence or sharp restriction of eye movements toward the paralyzed muscle. Strabismus, which develops due to paralysis of the eye muscles, is observed in lead poisoning, botulism, diphtheria, lesions of the brain and its membranes (syphilis, tuberculosis, meningitis, hemorrhage).

Among the diseases of the lens *cataracts* should be noted (clouding of the substance or capsule of the lens). The initial cataract can be detected only by biomicroscopy. In advanced cataracts, the pupil is grayish, grayish-white, milky white. The degree of decrease in visual acuity depends on the intensity of opacity and with complete cataract reaches light perception.

**Examination of intraocular pressure**, in addition to tonometry, can be performed by the palpation (finger) method. The patient must look down. The doctor's fingers are palced on the patient's forehead, and the index finger – on the upper eyelid, protruding 8-10 mm from the edge of the eyelashes, so that the cartilage of the upper eyelid does not fall under the fingers. Very careful pressure is applied to the eye alternately with the index fingers of both hands like 'luctuations'. This reveals the idea of density, which allows the doctor to conditionally indicate the intraocular pressure as follows: TN – normal pressure, T + 1 – slightly elevated, T + 2 – sharply elevated, T + 3 – the eye is hard as a stone.

*Glaucoma ("green water")* is a chronic eye disease with a constant or periodic increase in intraocular pressure, optic nerve atrophy (glaucomatous excavation) and changes in visual fields. It can be *primary* (caused by trophic disorders in the tissues of the anterior eye, especially its drainage system – changes in the vascular bed and hemodynamics of the eye) and *secondary* (increased intraocular pressure and related changes combined with a different clinical picture of the underlying disease).

Shspe of *pupils*, their uniformity, reaction to light, position and convergence, their 'pulsation' are of great diagnostic value for a number of diseases. *Pupil narrowing (myosis)* occurs in case of uremia, tumors and intracranial hemorrhage, morphine poisoning. *Pupil dilation (mudriasis)* occurs in

case of comatose states (except for uremia and hemorrhage in the brain), as well as atropine poisoning. *Pupil unevenness (anisocoria)* is observed in case of the injuries of the nervous system.

Retraction of the eye on one side, narrowing of the orbit, lowering of the upper eyelid and narrowing of the pupil form the *sign (triad) of Horner-Claude Bernard* (lesion on the eponymous side of the pupil sympathetic innervation after vagosympathetic blockade). Dilated eye slit and eyelids that do not close – evidence of facial nerve palsy; ptosis of the upper eyelid is one of the most important symptoms of some lesions of the nervous system.

*Exophthalmos* is a bulge of the eyeball forward due to an increase in the volume of orbital tissue, primarily in the retrobulbar space, due to various inflammatory, neurodystrophic, traumatic and tumor, local and general processes (basal disease, lymphadenosis, pathological processes in the skull, etc.).

Determination of visual acuity is carried out using a table with letters, which is placed in a special box, which is hung on the wall opposite the window. The patient sits facing the table at a distance of 5 m from it. Each eye is examined separately.

### Nose

It can attract attention either by a sharp increase and thickening (acromegaly), or a change in its shape (rhinoscleroma). A stuffy nose is caused by humus syphilis. Deformation of the soft tissues of the nose is observed in lupus.

*Atresia and synechiae of the nasal cavity* (connective tissue, cartilage or bone adhesions that completely or partially close the nasal opening) are rarely congenital, more often they are the result of smallpox, diphtheria, typhoid, lupus, syphilis, scleroma, trauma or galvanic therapy in the nose. Characterized by partial or complete exclusion of nasal breathing on the affected side. It is diagnosed by palpation and rhinoscopy. *Curvature of the nasal septum* is a consequence of abnormal development of the facial skeleton or injury. The curved part of the nasal septum often has bone and cartilaginous thickenings in the form of a ridge or spike. It is characterized by difficulty or exclusion of nasal breathing. Chronic

inflammation of the ear canal and eardrum often occurs. A crooked nasal septum that impedes the outflow of secretions from the paranasal sinuses can contribute to the development of sinusitis. Curvatures, spines and combs, in contact with the sink sometimes cause reflex neuroses.

Causes of *nosebleeds* can be nasal injuries, surgery in the nasal cavity, tumors, acute infectious diseases, hypertension, hemorrhagic diathesis. Nasal bleeding may start suddenly. Usually its source is in one half of the nose, it can stop on its own or last for a long time. Bleeding occurs from different parts of the nasal mucosa, but in most cases from the anterior lower part of the nasal septum.

*Rhinitis* is an inflammation of the nasal mucosa. There are acute and chronic forms. *Acute rhinitis* can be an independent disease or a symptom of an acute infectious disease (influenza, measles, diphtheria, etc.). At first there is a slight malaise, dryness in the nasopharynx, itchy nose. Nasal breathing is difficult, there are sneezing, tearing, decreased sense of smell, the tone of voice changes, there is abundant fluid from the nose. Subsequent nasal discharge becomes mucopurulent. *Chronic rhinitis* is divided into chronic catarrhal (simple) – one that lasts or repeats acute rhinitis; chronic hypertrophic – a consequence of chronic catarrhal rhinitis; chronic atrophic rhinitis – due to adverse climatic, occupational conditions, etc. *Rhinitis is vasomotor, allergic* – a local anaphylactic reaction of the body to any allergen: it is a neuro-reflex disease, observed in people with general autonomic disorders. *Ozena (smelly rhinitis)* is a chronic disease of the nasal cavity with a sharp atrophy of the mucous membrane, the formation of thick secretions that dry up in the stinking crust, thinning of the bone tissue of the shells and walls of the nose. *Nasal polyps* are formed mainly as a result of prolonged irritation of the mucous membrane, are single and numerous, have different shapes. Often the cause of polyps is an allergy. Allergic polyps are prone to recurrence. *Sinusitis* is an acute or chronic inflammation of the paranasal sinuses. There are the following types of sinusitis – *heimoritis*, inflammation of the mucous membrane of the maxillary (maxillary) sinus; *frontitis* – inflammation of the frontal sinus; *ethmoiditis* – inflammation of the lattice labyrinth and *sphenoiditis* –

inflammation of the wedge-shaped sinus. The disease can be unilateral or bilateral, with the damage to one or all paranasal sinuses – the so-called *pansinusitis*. **Foreign bodies** are most common in children. Pieces of food that get there during vomiting can also get stuck in the nasal cavity. Sometimes lime and phosphorus salts are deposited around the foreign body, which is in the nasal cavity for a long time, resulting in the formation of the so-called nasal stone – *rhinolite*.

### **Mouth**

When examining the mouth and throat, attention is paid to its shape (symmetry of its corners, constantly open mouth), lip color, blistering (Herpes labialis), cracks, cheilitis (inflammation of the red border, mucous membranes and skin of the lips). On the mucous membrane of the oral cavity thrush can be found in case of the prolonged use of antibiotics, hemorrhage, canker sores, pigmentation, Filatov-Koplyk's sign, blisters of foot and mouth disease. Dryness of the mucous membrane of the oral cavity is the best indication of dehydration, its bluish color – of cyanosis, sharp pallor – of anemia. **Xerostomia** – dryness in the mouth, pathogenesis associated with suppression of salivation. It is observed in patients with Sjogren's syndrome, radiation sickness, diabetes.

**Gum** changes are observed in a number of diseases (scurvy, pyorrhea, acute leukemia, diabetes), as well as intoxications (mercury, lead). **Gingivitis** – inflammation of the gums; it can be generalized when the gums are affected around all the teeth of one or two jaws, and localized – the gums around one or more teeth are affected. Development is caused by endocrine disorders, immunodeficiency, hypovitaminosis C and others.

Examination of **teeth** indicates various abnormalities of their shape, position, size. The absence of many teeth is of great importance in the etiology of a number of diseases of the digestive system. Up to 98% of the population suffers from **dental caries** – a disease characterized by progressive destruction of the hard tissues of the tooth. Caries is quickly complicated by inflammatory disease of the pulp of the tooth, then the periodontium and other tissues. The main symptom is a

change in the color and consistency of enamel and dentin, then – a cavity that increases in width and depth. Open pulp is very responsive to mechanical, thermal and other stimuli. Carious teeth as a source of infection can cause diseases of other organs.

**Tongue** movement abnormalities are observed in some lesions of the nervous system, severe infections and intoxications. Significant enlargement of the tongue is observed in case of myxedema and acromegaly, sometimes in case of glossitis. Clean, red and wet – at peptic ulcer disease; crimson – at scarlet fever; dry, covered with cracks and dark brown oozing – at peritonitis, heavy intoxications; with no papillae, smooth, polished (so-called Hunter's tongue) – at Addison-Biermer disease. "*Varnish tongue*" occurs in case of gastric cancer, pellagra, sprue, ariboflavinosis; local thickening of the epithelium (leukoplakia) – in smokers. With the help of the examination it is possible to detect local pathological processes in the tongue (ulcers of various etiologies, scars, bite marks during an epileptic seizure). **Glossitis** is a catarrhal or purulent inflammation of the tissues of the tongue. This term also means symptomatic (pernicious anemia, avitaminosis, some dermatoses, acute infections) changes in the tongue and developmental abnormalities (diamond-shaped, folded, etc.). In case of *catarrhal glossitis*, a burning sensation is present in the tongue, pain when eating spicy food. The tongue is hyperemic, swollen, the papillae are preserved. In case of the *abscess in the tongue* – increasing pain that increases with touch; speech is slurred, salivation, tongue is enlarged unevenly, tumor borders are indistinct, development is slow. Phlegmon of the tongue – pain, swallowing, speech, breathing, salivation.

Further examination of the mouth makes possible to evaluate the condition of the **tonsils** (accumulation of lymphadenoid tissue), their size, color, consistency. Yellow and white blisters that glow through the mucosa indicate *follicular sore throat*, yellow and white plaque localized in the mouth of the lacuna – about *lacunar sore throat*. In clinical practice, it is necessary to differentiate the latter from *diphtheria*, which is the most dangerous in epidemiological terms due to further complications. Diphtheria plaque is dirty gray, extends beyond the tonsils,



poorly removed from the surface, the mucosa beneath it are with erosions; lesions are often unilateral (especially in mild and moderate forms). If diphtheria is suspected, a swab should be taken immediately for bacteriological examination for diphtheria. Diagnosis of *peritonsillar abscess* is not difficult. The typical clinical picture that develops after sore throat: unilateral hyperemia and sharp swelling of the soft palate, protrusion of the tonsils to the midline, and a significant increase in body temperature indicate inflammation of the tonsils. *Foreign bodies* get into the throat with food (fish bones, cereal husks, pieces of wood, etc.), more exceptionally – fragments of dentures, pins, nails (tailors, shoemakers). Most often, sharp foreign bodies are stuck in the throat, tonsils, root of the tongue; in the second part of the throat they it happens rather seldom. The diagnosis is made on the basis of the examination of the throat, palpation, radiography.

### **Ears**

Examination of the ears reveals the absence or very small or large auricle, various changes in shape or location (cat's ear, monkey's ear), its protrusion.

*Othematoma* – hemorrhage in the outer surface of the auricle (in its upper third) between the cartilage and cartilage, sometimes cartilage and skin. Cause: trauma to the auricle (in wrestlers, boxers); in the elderly or exhausted people may occur spontaneously or with prolonged pressure on a hard pillow. *Sulfur plugs* – accumulation of earwax in the external auditory canal due to increased secretion of sulfur glands located in it. Earwax is delayed due to its stickiness, narrowness and tortuosity of the external auditory canal, irritation of its walls; sometimes light yellow or dark brown. If the sulfur plug does not completely cover the ear canal, it does not cause any disorders. At full obturation there are feelings of ear congestion and hearing loss, autophony (resonance of one's own voice in the closed ear).

The diagnosis of *tympanic membrane damage* is made on the basis of otoscopy: the perforation has irregular sharp edges are covered with blood clots. Symptoms: severe pain, tinnitus, hearing loss. From the side of the ear canal is always violated the integrity of the eardrum. The bones of the middle ear are also

injured and its cavity is filled with blood, which can fester. When the inner ear is damaged, the signs of irritation of the vestibular apparatus come to the fore: nausea, vomiting, dizziness, imbalance, nystagmus. *Otitis* – acute or chronic inflammation of the middle ear in frequency, severity of complications is at the heart of all ear pathology. It usually develops due to the spread of infection from the nose and nasopharynx through the Eustachian tube. It is characterized by severe pain in the ear, loss of hearing, noise, ringing in the ear, high body temperature, etc. The eardrum is red, sometimes it protrudes; then the exudate becomes purulent, there is a crack. The defect is often very small.

### **Neck**

Examination of the neck reveals a visible pulsation of the carotid arteries, which occurs in aortic valve insufficiency, thyrotoxicosis. Swelling and pulsation of the external jugular veins is in case of the insufficiency of the tricuspid valve (*Bamberger's sign*).

On the surface of the neck you can see enlarged lymph nodes (tuberculosis, lymphogranulomatosis, lymphocytic leukemia, cancer metastases), diffuse or partial enlargement of the thyroid gland, middle and lateral congenital cysts and fistulas.

*Crooked neck* – curvature of the neck with an unnatural inclined position of the head. There is an *acquired crooked neck* (trauma of the soft tissues of the neck and cervical spine, myositis, scarring of the crooked neck after a burn) and *congenital* (reduction of the pectoralis major muscle).

Unilateral edema of the submandibular salivary gland is most often caused by obstruction of its excretory duct by a stone. Swelling increases and it is manifested by pain during chewing (increased saliva secretion and difficulty in its outflow). At palpation, the swelling is smooth, soft and painful at first. Then it becomes dense and painless due to fibrosis. The stone itself can sometimes be felt under the tongue in the area of the opening of the excretory duct or detected radiologically (Fig. 35).

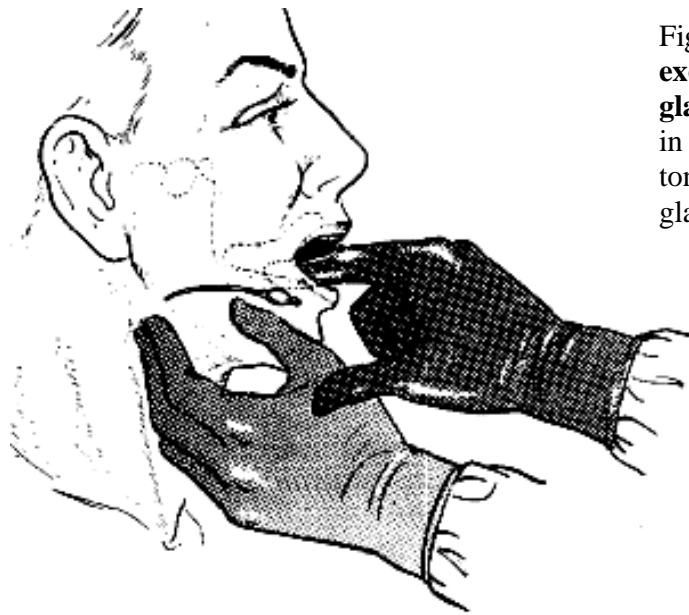


Fig. 35. **Salivary stone in the excretory duct of the submandibular gland:** bimanual palpation of the stone in the opening of the duct under the tongue and on the side of the swollen gland.

**Congenital fistulas and cysts of the neck.** The *subcutaneous cyst* has the form of a convex formation, smooth and rigid at palpation. Sometimes a connection is formed with the external environment in the form of a coccygeal fistula. The *middle cyst of the neck* is located clearly along the midline between the thyroid cartilage and the hyoid bone. It is formed from a completely unhealed thyroid-lingual duct, the opening of which opens at the root of the tongue.

The median cyst of the neck cannot be physically distinguished from the goiter of the paramidial sprout of the thyroid gland (lingual goiter) (Fig. 36 a, b).

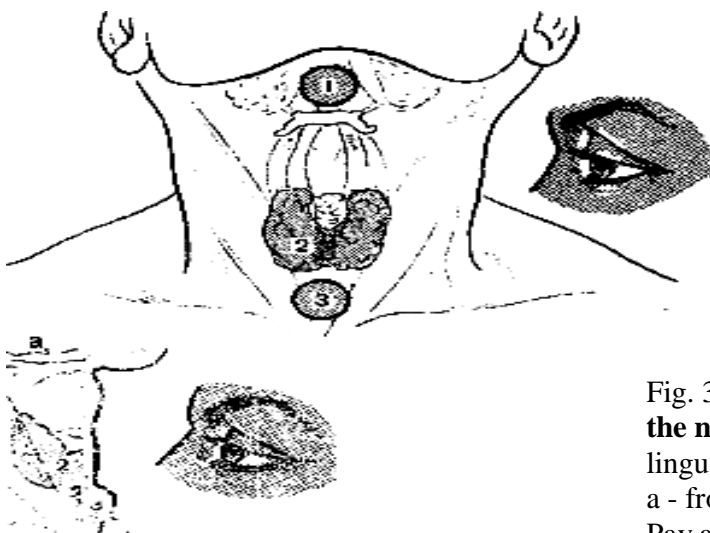


Fig. 36. **Topography of middle tumors of the neck:** 1 - middle cyst of the neck and lingual goiter; 2 - goiter; 3 - dermoid cyst: a - front, b - side.

Pay attention to the attitude to the cartilage and larynx!



Fig. 37. Lateral fistula of the neck.

The lateral cyst of the neck always lies at the anterior edge of the sternocleidomastoid muscle (Fig. 37). It is formed from embryonic gill arches and is sometimes associated with the oral cavity with a fistula, which in turn crosses the bifurcation of the carotid artery and opens in front of the tonsils, regardless of the level of the cyst on the neck. The soft consistency allows to distinguish it from a malignant tumor or chronic lymphadenitis, painlessness - from acute lymphadenitis,

and immobility at swallowing - from a goiter. Most often, these cysts regenerate into bronchogenic cancer. Lateral solid and painless tumor may be a vagus *nerve neuroma*. It does not shift when swallowed and leads to paresis of the recurrent nerve. A dermoid cyst may be located under the laryngeal cartilage, in the *sternal notch* (Fig. 36). It does not shift when swallowed and thus differs from the goiter. Its surface is smooth, the consistency is slightly harder than ordinary bones.

**Zenker's Diverticulum.** Between the horizontal fibers of the annulus and the oblique fibers of the lower pharyngeal compressor, in the Killian triangle, a weak spot is formed on the posterior wall of the "mouth" of the esophagus, which contributes to the pulsating diverticulum.

At first, patients complain of swallowing disorders and eventually spastic pain in the upper esophagus; there is vomiting of undigested food while eating, or food eaten a few hours and days ago. Bad breath and hoarseness are typical. The act of swallowing is accompanied by gurgling, which can be heard in the distance. In extremely rare cases, the protrusion on the left side along the edge of the sternocleidomastoid muscle is determined. Small diverticula can be very severe (Fig. 38).



Fig. 38. **Diverticulum of the cervical part of the esophagus** (according to S.P. Fedrov).

### Thyroid gland

Organic changes of a thyroid gland in most cases can be found at inspection (fig. 39). Functional disorders can also often be detected during a general examination. Particular attention is paid to: condition of the skin; tremor; ocular symptoms.

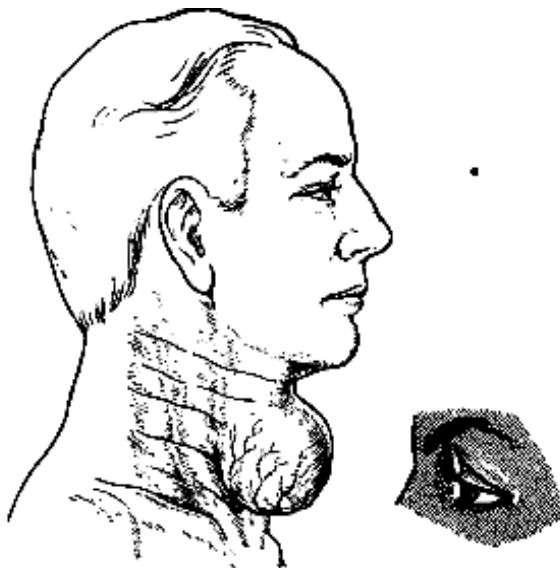
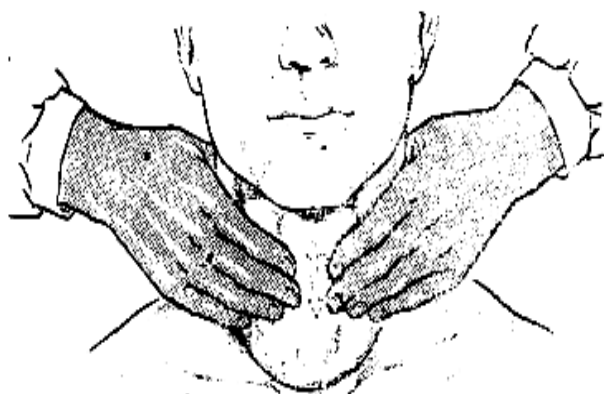


Fig.39. **Nodular goiter:** local examination. Varicose veins.

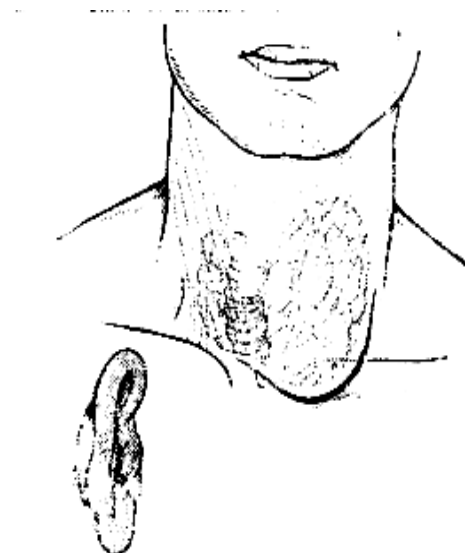
Enlargement of the thyroid gland or its parts can be established by local examination. First, determine the position of organic changes (Fig. 36). The enlarged lateral lobes are located near the midline, and the enlargement along the midline emerges from the isthmus and it is located below the laryngeal cartilage. In many cases, the typical shift when swallowing is noticeable during the examination. At local examination it is necessary to pay special attention to:

- position of the goiter;
- its shift at swallowing;
- inflammatory signs;
- venous stasis.

Palpation of the thyroid gland is performed with both hands, standing behind the patient (Fig. 40). The patient sits comfortably, his/her head is in a natural position, his/her chin is not raised. The normal thyroid gland can be palpated when the neck is thin: it is in the form of a bipartite tight overlay on the trachea. If there are organic changes, it will be possible to define precisely its properties and the relation to a trachea, assume on its anatomic position at inspection (Fig. 41).



**Fig. 40. Palpation of the thyroid gland with both hands from behind.** Checking mobility during the act of swallowing.



**Fig. 41. Moving the trachea at the nodular goiter of one lobe of the gland.** At narrowing of a trachea it is sometimes possible to listen to a stridor while breathing in.

If you now leave the palpable hands in place and ask the patient to swallow, the goiter will be removed at the top. The emergence of the lower pole from the thoracic aperture is controlled by both ring fingers. In case of hyperthyroidism, it is sometimes possible to listen to systolic movements. Indirect laryngoscopy, which is easy to perform, is recommended for examination of goiter and hoarseness (Fig. 42).

The most typical reason for surgery is nodular goiter. The node can provide a mechanical effect and lead to breathing or swallowing disorders. In most cases, there is a history of goiter that has existed for years and increases gradually. Rapid growth may indicate cyst formation, hemorrhage, or malignancy. Huge goiter sometimes causes local venous stasis. During calcification, the node acquires iron density, during degeneration it is woody.

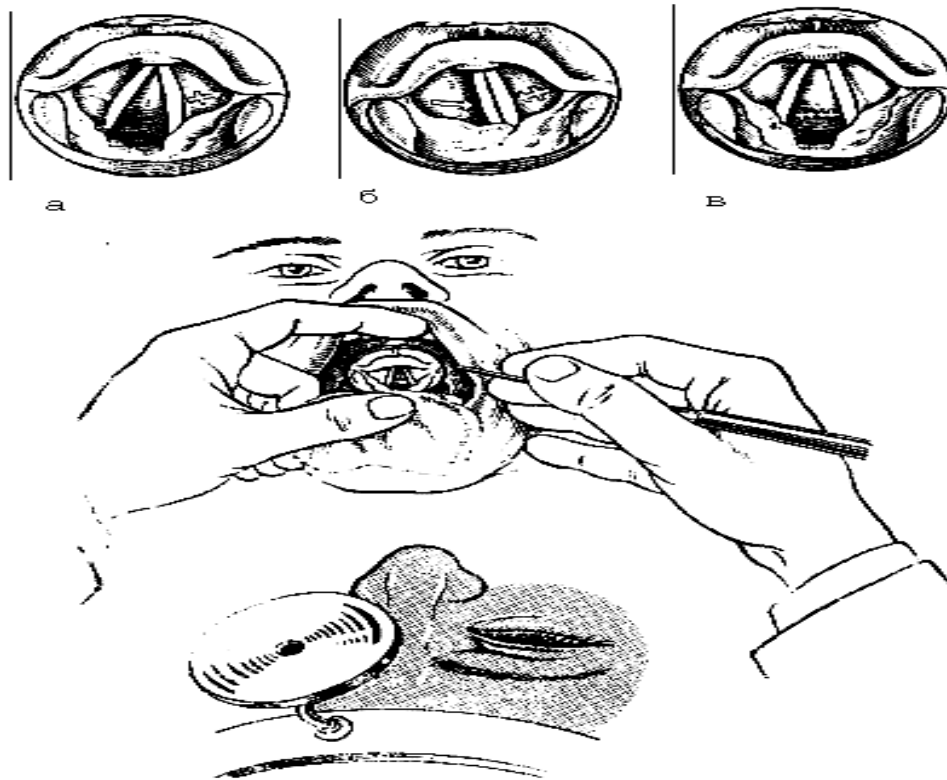


Fig. 42. **Indirect laryngoscopy:**

1. a – paresis of the recurrent nerve of the left side; б – compensated left motor paresis of the recurrent nerve; 2 – paresis of the recurrent nerve on

**Thyrotoxicosis.** It includes a group of diseases with increased thyroid function from mild hyperthyroidism to the most severe form – Graves' disease. In case of mild hyperthyroidism, there are no other eye symptoms. There are neurological signs, weight loss, tachycardia, weight loss, sweating. Exophthalmos (exfoliation is *a sign of Dalrymple*) is a classic for the underlying disease (Fig. 43).

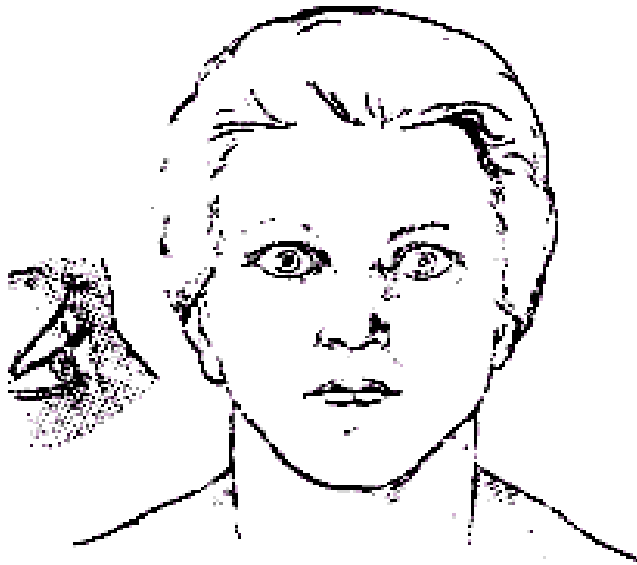


Fig.43. Graves' disease.

Examination: edema, eye luster, smooth moist skin.

Thyrotoxicosis is characterized by trembling hands (*Sharko's sign*); brown skin pigmentation (*Jellinek sign*); delayed formation of wrinkles on the forehead, or the absence of them when looking up (*Geoffroy's sign*); trembling of the body or limbs (*Marie's sign*); shallow and rapid trembling of lowered eyelids (*Rosenbach's sign*); eyelid pigmentation (*Telle's sign*); sharp

flicker (*Shtelvag's sign*); the upper eyelid of the tracking lower arm at the end of the finger, which moves downwards, drops abruptly (*Popov's sign*); when moving the gaze from top to bottom, the upper eyelid first lags behind, and then catches up with the eyeball, with a strip of sclera between the upper eyelid and the iris (*Greffe's sign*); sometimes a peculiar buzzing over the thyroid gland is heard (*Gutman's sign*); in some cases there is anisocoria (*Kiis' sign*); when fixing the gaze on a close object, the eyes cannot be in a position of convergence for a long time and one of them soon recedes (*Moebius sign*); the upper eyelid moves up faster than the eyeball (*Kocher's sign*); sometimes you can hear a soft hum over the closed legs of the patient (*Bausman's sign, Snellen's sign*); in the initial stage of thyrotoxicosis, there may be a slight twitching of the eyeball with alternating reduction and withdrawal of the eye (*Wilder's sign*); when fixing the gaze on the movement in front of the lower from top to bottom objects of the upper eyelid in the patient when the eyeball goes down will rise due to the spastic contraction of the frontal muscle (*Senton's sign*). However, the suspicion of thyrotoxicosis falls on very nervous patients, exhausted, whose eyes become abnormally bright. If there is a history of nervousness, tremor, sweating, weight loss, increased appetite,



concussions and heart failure and hair loss, this suspicion is confirmed. At examination, there are symptoms such as small tremors, which are noticeable with outstretched fingers, moist skin and classic ocular symptoms in the form of weak convergence, lag of the upper eyelid from the iris when looking down and infrequent blinking.

In case of a *Graves' disease* the goiter is increased diffusely, of a soft consistence and sometimes it slightly pulsates. If hyperthyroidism occurs in a nodular goiter, it is a Graves'-fixed goiter (toxic adenoma). But hyperthyroidism can occur without an enlarged thyroid gland. Tachycardia is almost certain, heart rate is less than 80 beats per min. In most cases, hyperthyroidism is excluded. The amplitude of blood pressure is usually markedly increased. Atrial fibrillation, which occurs suddenly, may be the first symptom of hyperthyroidism. At the later stages, symptoms of heart failure can be detected. Examination of reflexes from Achilles tendons shows their increase on both sides. In case of toxic adenoma, the symptoms of hyperthyroidism are much less pronounced. Sometimes clarifying examinations are performed in case of hyperthyroidism: examination with radioactive iodine (determination of hormonal activity in vitro, thyroxine levels in the blood, radioimmune analysis of thyroid hormone after the stimulation of the pituitary gland with thyroid-stimulating hormone).



Fig. 44. Myxedema in hypothyroidism after strumectomy.

**Hypothyroidism** leads to *myxedema*. Patients are prone to slight overweight and look apathetic, facial expressions are tired (Fig. 44). The skin is dry, wrinkled, its elasticity is reduced. Reflexes from Achilles tendons are slowed down and weakened.

*Hoshimoto's lymphoid goiter* or autoimmune thyroiditis is

more often accompanied by mild hypothyroidism. It occurs only in women. At considerably increased, covering all thyroid gland, firm and hilly change the only clinical indication for a disease can be the decrease in hormonal function. It is very important to suspect this diagnosis, so the reduction of thyroid tissue during surgery can have sad consequences. Clarifying examinations (laboratory): autoimmune antibodies in serum.

**Goiter of special localization** is a goiter that comes mainly from the lower part of the gland, it can go down through the upper aperture of the sternum and take the thoracic position. The organs of the upper interstitium may be involved in

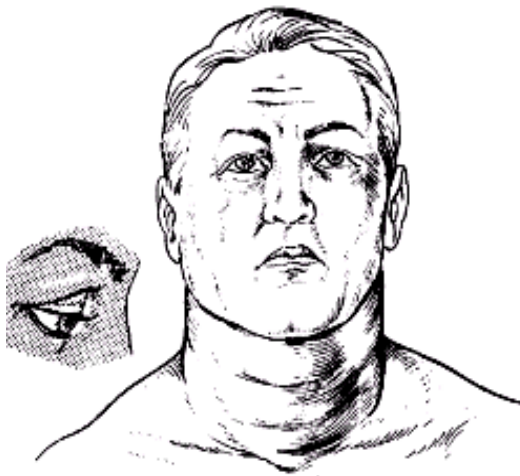


Fig. 45. **Thoracic goiter.**  
Examination: venous stasis on the neck and head. Stagnant neck.

the process. As a result of compression of veins blood outflow is slowed down and veins of a neck and a head expand (Fig. 45).

**Chronic strumitis.** The growing invasive, iron-dense Riedel's goiter is recognized by its lack of mobility when swallowed. Compressing neighboring organs, it leads to the same manifestations as a malignant tumor. In both of these diseases, the consistency of the gland is firm and on this basis they are almost impossible to

distinguish. The surface of this gland, dense as iron, is smooth, and both particles are affected; one of them is slightly more affected than the other. Sometimes patients complain of pain. There is no difficulty in swallowing, but patients often complain of shortness of breath. **Subacute giant cell de Quervain's thyroiditis** causes spontaneous pain with irradiation to the surrounding tissues and ears, as well as pain at palpation. The skin is hyperemic, the thyroid gland is diffusely enlarged, hard and bumpy. According to the general malaise, which is a manifestation of a chronic infection that is sluggish, this disease can be distinguished from other diseases of the thyroid gland, especially from malignant tumors.

**Thyroid cancer.** A nodule that appears in the thyroid gland is prone to rapid growth and penetrating into neighboring tissues and organs, limited mobility, difficulty swallowing, shortness of breath, pain that radiates into the back of the head, chin and shoulder. Rotary (complete loss of voice) and sympathetic nerves (Horner's sign) can be involved. Significant stagnant veins of the neck are typical even the early stages of the disease. Differential-diagnostic sign of benign and malignant thyroid tumor (***Berry's sign***): in case of a benign tumor the carotid artery is well palpated behind the tumor (the tumor recedes), and in malignant it is not palpated or poorly palpated (tumor densely overgrows the artery).

### **Examination of the skeletal system**

It starts with an examination. Attention is paid to the deformation of the limbs, chest, head, spine.

Careful examination of the history and the mechanism of the injury provides a valuable indication for its type. The survey on the nature of pain, the time of its onset and the limitation of the function it causes are of great importance.

**Fracture of bones** is characterized by the following classic features:

***pain*** – in most cases it is constant and strictly localized; typically there is an increase in pain when bending the bone along the axis: *pain from bending*. However, the examination of this symptom should be limited to cases where the fracture cannot be diagnosed immediately by a strong curvature of the axis, for example, after a fracture of ribs, fracture of the metacarpal or metatarsal bones;

***Displacement along axis*** is a more important clinical sign in most cases when there are fractures and it makes possible in many cases to diagnose quickly. Classic axis displacements – *lateral* (axes of both fragments are located next to each other or under each other), *at an angle* (axes of broken bones are bent at the fracture site), *rotation* (axes of rotation of two adjacent joints rotated in opposite directions), *reduction or elongation*;

**swelling** – due to the access of blood from the damaged bone marrow canal and concomitant soft tissue damage, a hematoma is formed, which can be of different sizes depending on the damaged bone fragment.

**Pathological mobility and crepitation** – their inspection causes severe pain and can cause additional injury, they are checked only as a last resort.

Each fracture examination should include a study of peripheral circulation and nerve function.

Circulatory disorders caused by fractures are common and can be the result of compression of blood vessels by hematoma, and direct and indirect injury of arteries and veins by bone fragments. Neurological prolapses can occur as a result of overextension of nerves, crushing between their fragments in the gap, edema or direct traumatic rupture. Their detection during the initial examination is very important, because nerve damage that is diagnosed later can be easily attributed to treatment.

**Ligament strain** – forced movements in the joint, determined by an injury that exceeds the normal volume along the axis of rotation, or mobility of the joint along the wrong axis of rotation. The first symptom is pain. In contrast to the fracture, it is exacerbated by pulling on the damaged joint, and at the same time when tapping on the axis, the pain remains the same or even decreases. **Swelling** depends on serous effusion in the joint caused by reactive inflammation, and on a large number of damaged blood vessels and can reach significant sizes.

**Dislocations** are characterized by disruption of the joints between two bones. One articular surface is displaced relative to the other, and as a result there is a deformation of the joint. Dislocations are possible only if the ligament and the joint capsule rupture at the same time. The size of these additional injuries determines **pain** and **swelling**. The main symptoms are a **violation of the continuity of the articular axis**, which leads to a more or less pronounced irregular condition, as well as to elastic fixation.

**Shoulder girdle.** In most cases, a fresh shoulder girdle injury can be diagnosed at examination. The examination is performed, if possible, in a patient

standing with his/her hands down. The patient is examined from the front, behind and from the side. At any serious injury there is a sparing position of the patient with the shoulder lowered and pressed to the upper half of a body, the bent forearm catches the eye. To check the movements, the patient raises both outstretched arms to the sides. One-sided protrusion of the shoulder to the top is pathological.

Fracture of the arch can be diagnosed even on examination (Fig. 46). Most often it is observed in the middle third, with a noticeable shift of fragments due to

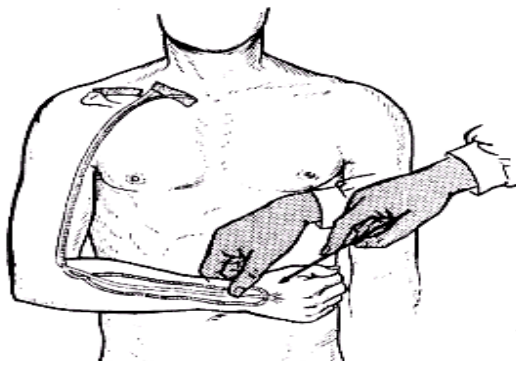


Fig. 46. **Fracture of the clavicle.** Displacement of fragments during inspection. Mandatory heart rate and sensitivity check.

the attraction of the sternoclavicular-nipple muscle up, and the deltoid and pectoral muscles – down. The upper arm on the injured side is lowered and pushed forward.

Dislocation in the clavicular-acromial joint is much more common than in the sternoclavicular.

The complete rupture of all ligaments (clavicular-acromial, clavicular-beak-like) is specified by the *phenomenon of the piano key*. To do this, the patient puts the hand of the injured side on the opposite upper arm, and the doctor presses in the vertical direction on the distal end of the clavicle. After the pressure ceases, the dislocated arch pops out of its joint again (Fig. 47).

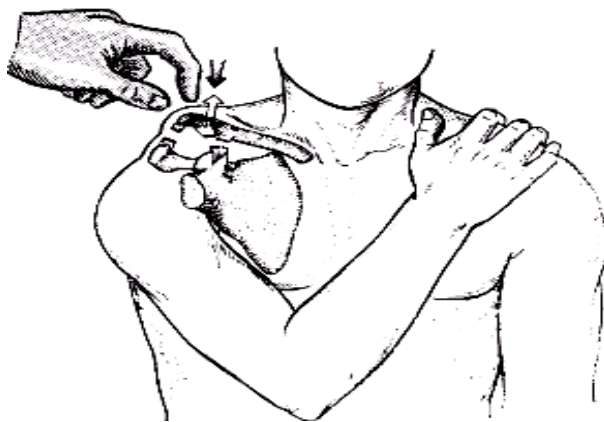


Fig. 47. **Complete rupture of the sprain in the clavicular-acromial joint.** The phenomenon of the "piano key" on palpation.

*Shoulder girdle syndrome*, in particular cervical rib and scalene muscle sign (costoclavicular syndrome). Cervical rib, anterior scalene muscle hypertrophy, or fibrous cord can compress the subclavian artery or nerve brachial plexus between the rib and clavicle. Nerve compression is more often manifested by shoulder pain and

paresthesia, mainly in the area of innervation of the ulnar, but also the median nerve. Prolonged development of the disease can lead to paralysis with muscle weakness, especially in the area of innervation of the ulnar nerve. Such unilateral vascular disorders as pallor, coldness, cyanosis and weakening of the pulse in the radial artery with the appearance of vascular noise indicate the compression of the artery. Stenotic noise is heard in the supra- and subclavian fossae.

**Shoulder dislocation** is one of the most common injuries (Fig. 48). Anterior submandibular dislocation is the most common. At it the head of a shoulder is felt

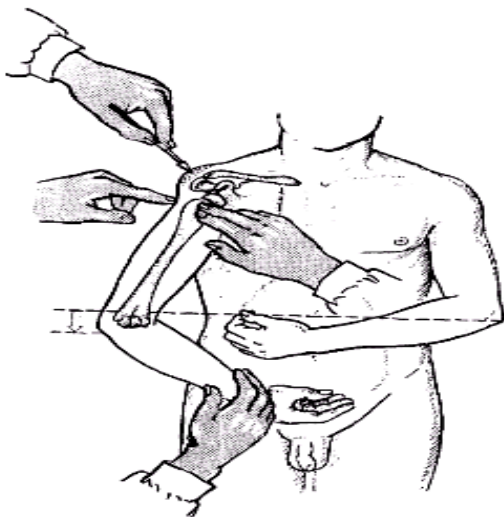


Fig. 48. **Submandibular anterior dislocation of the shoulder.** Spring fixation of the shoulder, easy removal, lowering of the

through pectoral muscles under a beak-shaped condyle. The arm is slightly apart, the shoulder is elongated, and the forearm is rotated outward. The head of the shoulder can constrict blood vessels and nerves. Although axillary dislocation is rare, diagnosis is possible at a glance; because the patient can not lower the arm and it remains in a raised position in a state of forced fixation through a stationary head of the shoulder in the axilla.

**Posterior dislocation** can be diagnosed by an empty articular cavity, which elasticizes the fixation of the arm, which is in a strong lead, and the empty fossa below the beak-like condyle (Fig. 49).

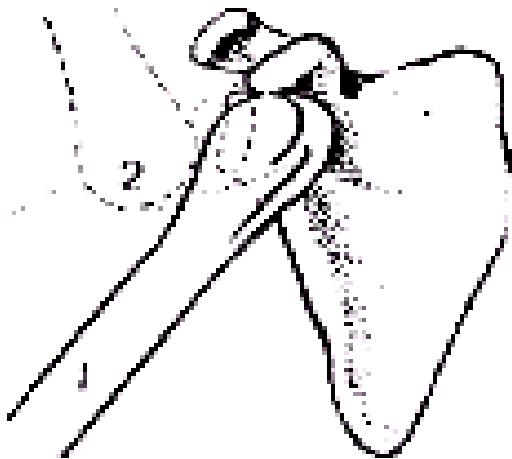


Fig. 49. **Dislocated shoulder.** 1 - submandibular, anterior dislocation (frequent); 2 - axillary dislocation (liquid); 3 - subcromial dislocation, posterior dislocation (liquid).

**Subcapital fracture and dislocation** – a weak arm without elastic fixation and an empty joint cavity. The broken head of the shoulder is deflected back in most cases, so the fossa under the beak-like condyle remains empty (Fig. 50).

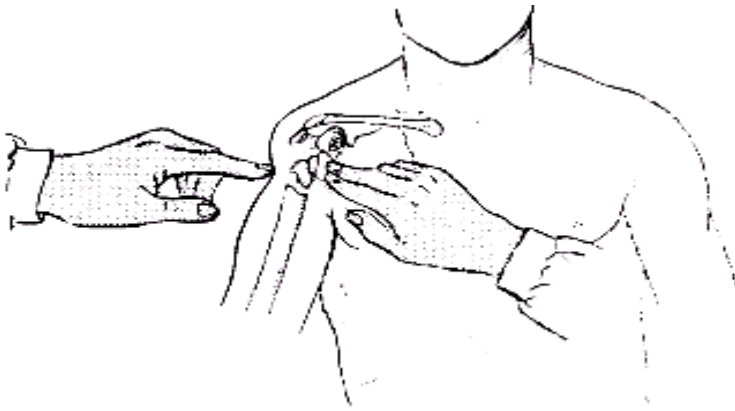


Fig. 50. **Fracture-dislocation of the anatomical neck of the shoulder.**

**Upper limb.** Particularly dangerous is the **oblique or helical fracture** at the border of the middle and lower thirds of the shoulder through the radial nerve, which in this place wraps around the humerus and is close to it (Fig. 51).

Its damage is easily recognized by the drooping wrist and loss of sensitivity. An isolated fracture of the ulna is often accompanied by dislocation of the head of the radial bone, giving a combination of what is referred to as a **Mantage fracture** (Fig. 52).

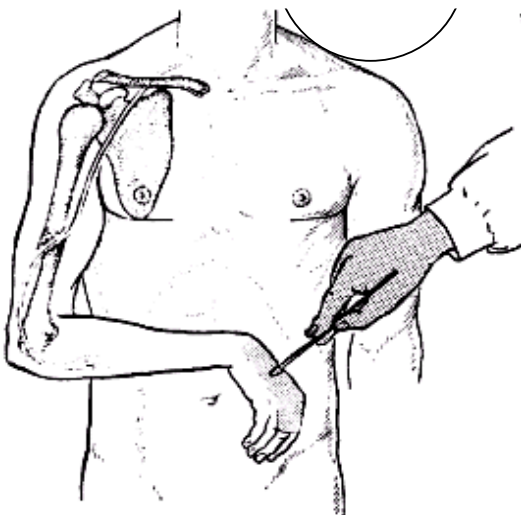


Fig. 51. **Fracture of the shoulder shaft at the border of the middle and lower third.** Danger of pinching of the radial

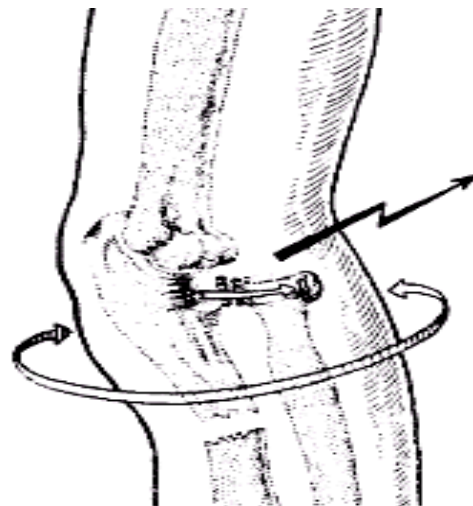


Fig. 52. **Mantage fracture.** Limited and painful pronation and supination.

**Elbow joint.** When the elbow joint is bent, the inner and outer condyles and the top of the elbow condyle form an equilateral triangle; when the elbow is unbent, all these three points are located on one straight line – the gutter line (Fig. 53a, b). At palpation it is possible to define condyles, an olecranon, a head of a radial bone, an articular crack and an ulnar nerve in its furrow. Palpation of the head of the radial bone is performed with a bent elbow joint. To do this, the doctor stands in front of the patient and his/her right hand embraces his/her right elbow from below and inside. The index finger rests on the outer condyle of the radial bone, and the middle finger determines the rotation of the head of the radial bone at the time when the patient pronates and supines the forearm. The ulnar nerve is palpated in its furrow, directly under the ulnar condyle. Strong pressure on the nerve causes paresthesia in the area of its innervation, especially in the area of the V finger and small palmar elevation. Paresthesia with

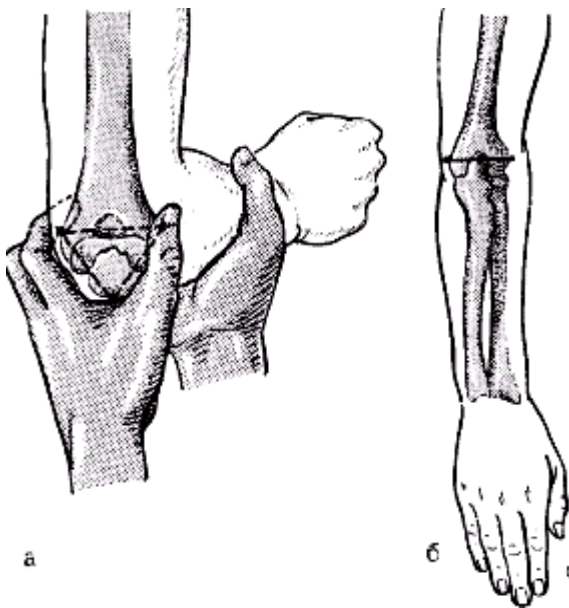


Fig.53. **Elbow joint:** a - at a bend - therefore at a right angle of a joint; b - with a sprained joint.

light pressure or movements in the elbow joint is pathological. There are *flexion and extension extensor fractures of the shoulder*. The diagnosis is made on the basis of general signs of a fracture. Intra-articular fracture causes hemarthrosis, which makes it difficult to bend. At the same time it is necessary to pay attention to compression of nerves and vessels.

*Fracture of the ulnar condyle* is characterized by detectable diastasis, which is formed as a result of pulling up the fracture of the triceps with a bent elbow joint. The displacement of the apex of the olecranon leads to a shortening of both sides of the triangle formed by the points of the bones at the bent elbow joint



and to the curvature of the straight line upwards at the unbent joint. Due to the rupture of the extensor apparatus there is an extensor contracture.

**Epicondylitis:** pain in the radial condyle is a fairly common and severe disease ("tennis player's hand"). Limited pain at palpation of the condyle of the radial bone and down from it. At the heart of this disease is overexertion of the extensors of the radial wrist joint.

**Forearm dislocation** is more common in children. It is recognized by the displacement of bone cognitive points. **Volkman's ischemic contracture** is a dangerous complication of unrecognized dislocation.

**The radial-carpal joint** should be examined in comparison with the opposite side, because the shape of the bone cognitive points (styloid process and the head of the ulna) varies greatly from individual to individual. The mobility test includes palmar and dorsiflexion of the hand, as well as the radial and elbow openings with the radial wrist joint extended. Feel the bony protrusions, the articular cleft, the navicular bone by pressing down and inward from the snuffbox (the hole between the tendons of the long and short extensors of the patient's finger and the tendon of

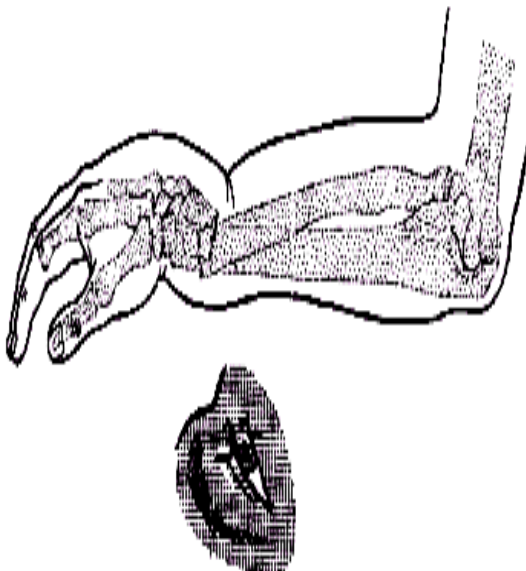
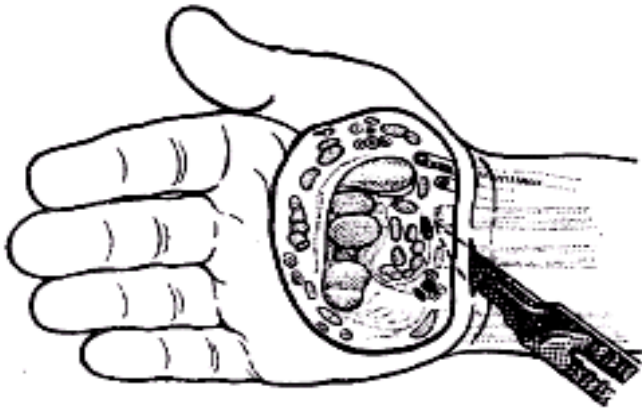


Fig. 54. Fracture of the radius at a typical site

the muscle that removes the thumb) and the semilunar bone by squeezing the back and back between the fingers. Transverse incisions on the palmar surface of the radial-carpal joint always arouse suspicion of injury to the median nerve, where it lies very superficially, just below the retinaculum flexorum (Fig. 54).

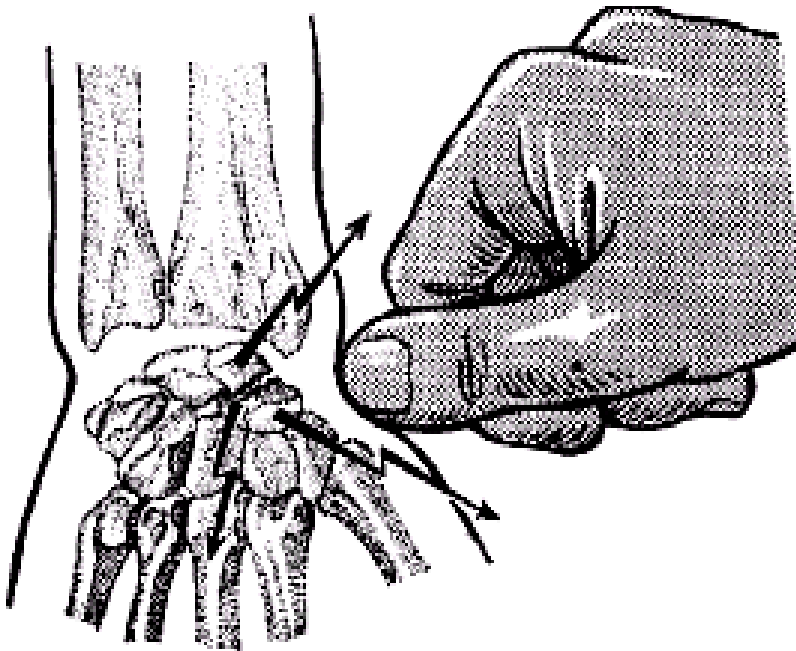
It is very common to break the beam in a typical place (Fig. 55). It is recognized by the forked or bayonet position of the radial-wrist joint, which depends on the posterior

displacement of the distal fracture, at the fracture site there is also a slight reduction of the hand due to shortening of the radial bone at the fracture site with the whole ulna.



**Fig. 55. Fracture of the radial bone in a typical place.**

*Fracture of the navicular bone* is accompanied by swelling and pain on palpation in the area of the snuff box between the long abductor muscle and the short muscle that extends the finger on one side and the long extensor of the thumb on the other side (transmission pain) (Fig. 56).



**Fig. 56. Fracture of the navicular bone.**

**Wrist.** If the life of the person is not in direct danger, then the function of the wrist is the basis of professional activity of many people, which ensures their normal participation in society. In the anamnesis they get acquainted with the patient's profession, and under certain conditions – with his/her favorite occupation. At each examination check: a) coarse function; b) brute force; c) blood circulation and trophism; d) sensitivity; e) corns and traces of work; if item "a" provides an unsatisfactory result, then: f) the function of the tendons; g) significant nerves (radial, ulnar, median); h) bones and joints (Fig. 57 a, b).

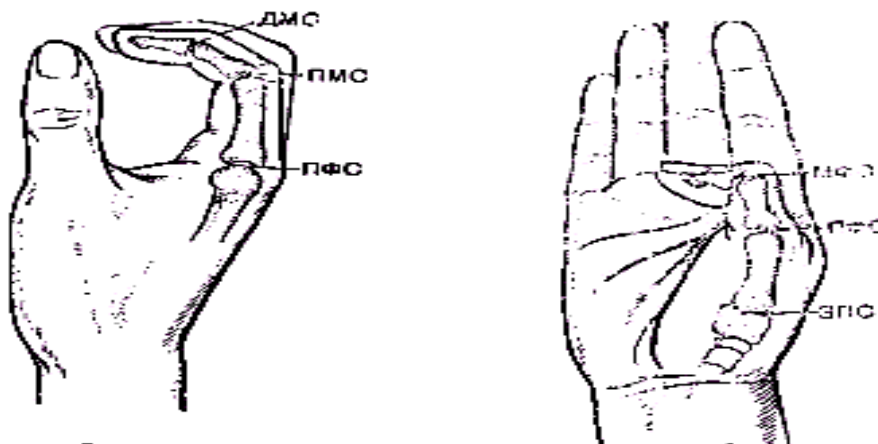


Fig. 57. Reduced designation of finger joints.

a) **Coarse function:** normal position at rest, clenched fist and good extension of the fingers. It is crucial to keep the flexion of the fingers. If the fingertips do not reach the palmar cavity with a clenched fist, the fingers are blocked. Measure the distance vertically, between the fingertips and the distal palmar fold and mark it as FTPD (fingertip - palm - distance) (Fig. 58).



Fig. 58. Coarse function.  
Explanation in the text.

If the FTPD is zero, then the brute force does not suffer even with limited flexion

in the distal interphalangeal joint (DIJ). If full function of all interphalangeal joints is required for work then, despite absence of FTPD (is equal to zero), at restriction of bending in a distal interphalangeal joint it will not be provided. In this case, the measure of limitation will be the distance between the finger pad and the distal palmar fold (Fig. 58 and 59), extension is checked by applying the back of the hand to the table surface (Fig. 60).

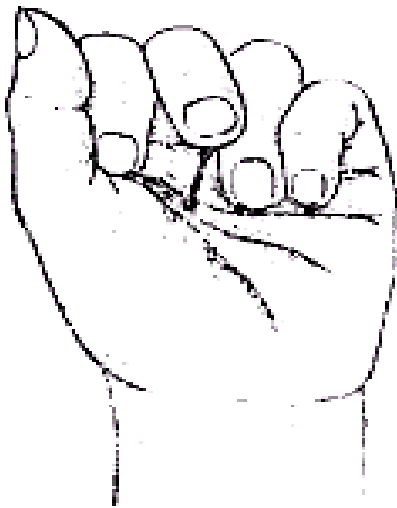


Fig. 59. **Coarse function.**  
Explanation in the text.

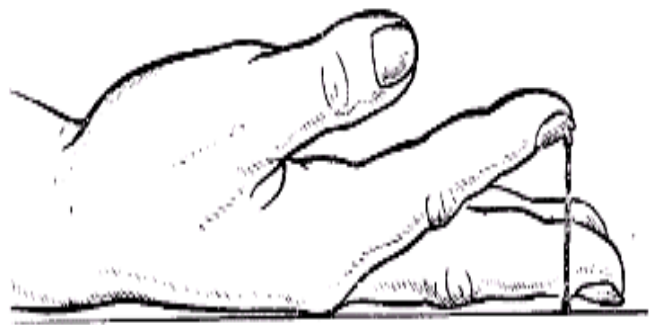


Fig. 60. **Lack of extension in the distal, proximal and metacarpophalangeal joints.** The black line equals the distance between the fingertip and the underlying surface.

**b) Brute force.** The doctor asks the patient to squeeze as much as possible the index and middle fingers of the crossed hands (Fig. 61). A noticeable difference in the hands gives an idea of the decrease in strength. In some cases, the measurement of force is done using a variety of techniques:

- technique of a hook – the patient is hung a heavy load on the finger bent in the interphalangeal joints with the elbow and wrist joints unbent;
- thin technique – the patient squeezes the doctor's index finger between I and the pads of II-V fingers;
- key technique – with the thumb the patient presses the object to the radial surface of the main phalanx of the index finger. The measurement of brute force can be done with the help of an ergometer.

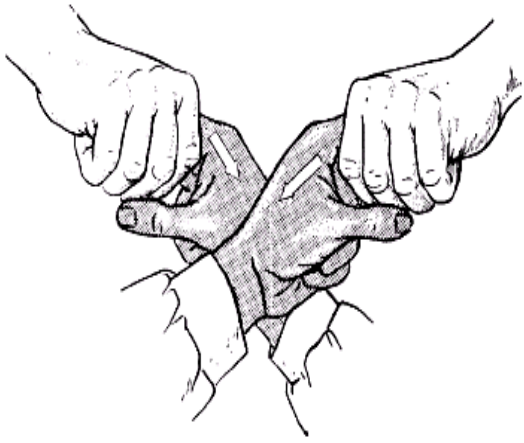


Fig. 61. Measurement of brute force by means of clutch technique.

c) *Circulation* is checked by squeezing the pad of a finger with a blunt object. A pale spot appears at the site of compression. With sufficient blood circulation, the spot disappears as soon as the pressure stops (Fig. 62).

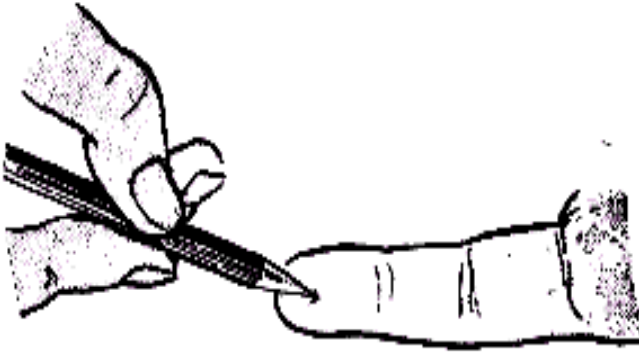


Fig. 62. Checking blood circulation.

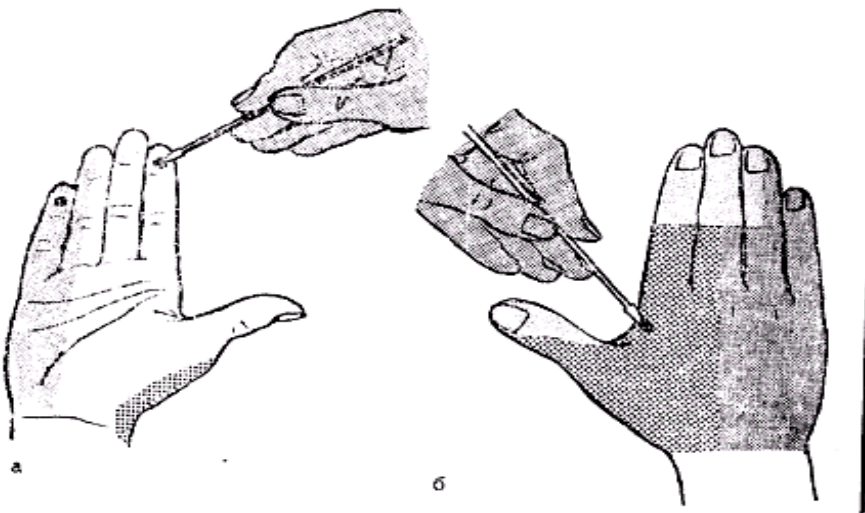


Fig. 63. Three-point abbreviated test in case of loss of sensitivity function of the branches of the large nerves of the hand: a – on the palm; dark stroke – ulnar nerve; light – median nerve; b – on the back of the hand dots marked radial nerve.

*d) Sensitivity tests* are important in case of hand injuries. Damage to the median nerve leads to the loss of sensitivity on the palmar surface of the terminal phalanx of the second finger, ulnar nerve on the terminal phalanx of the fifth finger from the palmar surface, radial nerve on the dorsal surface of the second and third metacarpal bones (Fig. 63 a, b).

The extensor tendons are stretched during flexion through the interphalangeal joints, as through a block. The flexor tendons do not have such a natural block. They bend by sliding on the connective tissue case – the tendon case. Particularly serious injuries are in the tendon case. The scars that form in them make it difficult to slide and function. In the area called "no man's land" the tendon suture is usually not superimposed (Fig. 64). This no-man's space extends from the distal palmar fold to the middle of the long fingers – the middle phalanges.

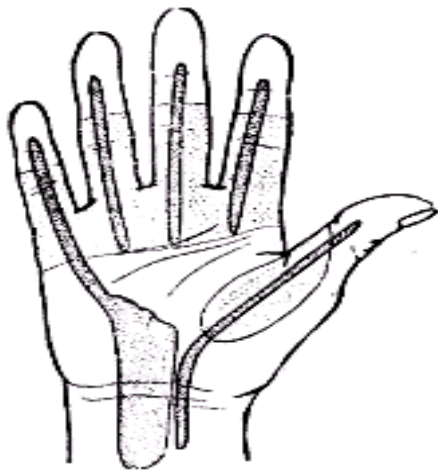


Fig. 64. "No man's space" - a bright area. The most common passage of tendon case is the dark area.

The tendons of the deep flexor digitorum are attached proximal to the end phalanges of the fingers after passing the superficial flexor and are responsible for bending the latter. The tendons of the superficial flexor digitorum are attached by two large fibers to the middle phalanges and bend them. Deep tendons bend both the end and middle phalanges of the fingers, and the superficial ones serve to strengthen. The main phalanges of the fingers are bent by the interosseous muscles and do not depend on the long flexor tendons. On the first finger there is a tendon case only for the tendon of the long flexor and the finger, which is shorter than all

other flexors. Tendon tension after contraction of the extensor muscle of the fingers causes extension only in the metacarpophalangeal joints. Extension of the proximal and distal interphalangeal joints is performed by the interosseous muscles, which have separate tendons. The extensors of the fingers are innervated by the radial nerve, and the interosseous muscles by the median and ulnar nerves.

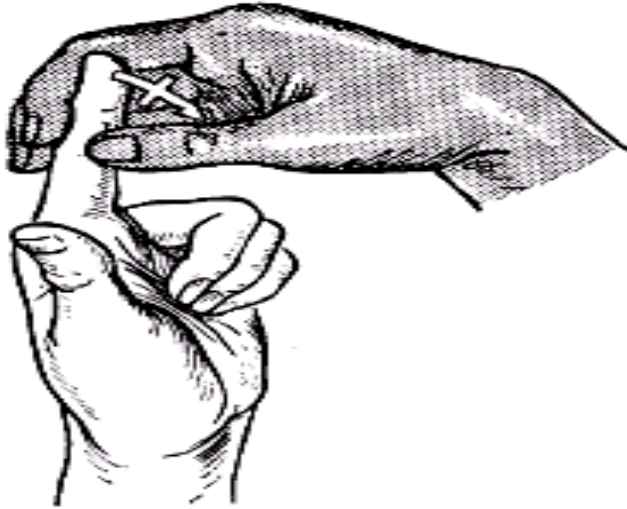


Fig. 65. **Injury of the deep flexor tendon:** after fixation of the middle phalanx on the palm side and the proximal interphalangeal joint on the back side, it

Damage to the deep flexor leads to complete loss of function in the distal interphalangeal joints of the fingers (Fig. 65). Proximal injuries lead to simultaneous loss of function of superficial and deep flexor tendons. The finger remains unbent, active bending is possible only in the metacarpophalangeal joint.

Isolated intersection of the superficial flexor tendons can also be established clinically (Fig. 66).

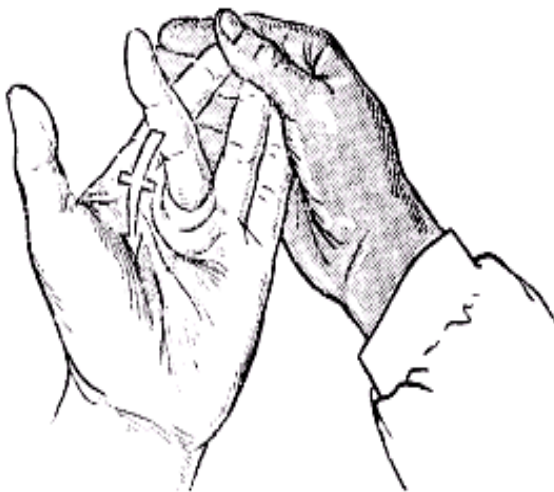


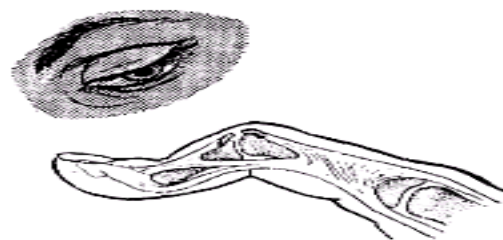
Fig. 66. **Isolated injury of the superficial flexor tendon:** when fixing the last fingers in the unbent position, it is not possible to actively bend the injured finger in the proximal interphalangeal joint.

Damage to the extensor tendons can be undiagnosed if it is located proximal to the metacarpophalangeal joints. Due to the connection of the tendons into the bundle, small movements in the metacarpophalangeal joint are still possible. However, tight application of the back of the hand and fingers to the table surface is impossible. The terminal phalanx of the first finger is stretched by a long tendon of the first finger. If the injury is located proximal to the metacarpophalangeal joint, a small extension is possible due to a short extensor and a finger, merging with a long extensor. Injury to the extensor tendon distal to the metacarpophalangeal joint results in prolapse of the extensor in the metacarpophalangeal joint (Fig. 67).

Immediately before the proximal interphalangeal joints, the extensors are divided into three bundles. The middle bundle flows straight and is attached to the base of the middle phalanx, and both side bundles are directed further and are attached together at the base of the terminal phalanx. If the middle bundle is crossed over the proximal interphalangeal joint, the lateral bundles and tendons of the vermiform and interosseous muscles slide to the palmar surface of the finger, which in turn leads to the posterior subluxation of the head of the main phalanx, as through a loop. As a result, there is a typical deformation, as when pressing a finger on the bell button (Fig. 68).



**Fig. 67. Injury of the extensor tendon of the metacarpophalangeal joint;**  
no extension in the metacarpophalangeal joint.



**Fig. 68. Injury of the extensor tendon in the area of the proximal joint;**  
deformation, as when you press the call button.



When a patient tries to stretch, the end phalanx is unfolded in the distal interphalangeal joint and it is bent in the proximal interphalangeal joint. If the extensor tendon is injured near its attachment to the base of the end phalanx or torn off from the bone, then extension in the distal interphalangeal joint becomes impossible. The hammer finger is formed (fig. 69). At full crossing of all three bunches of a tendon over a proximal interphalangeal joint the hammer finger can be formed in this joint.

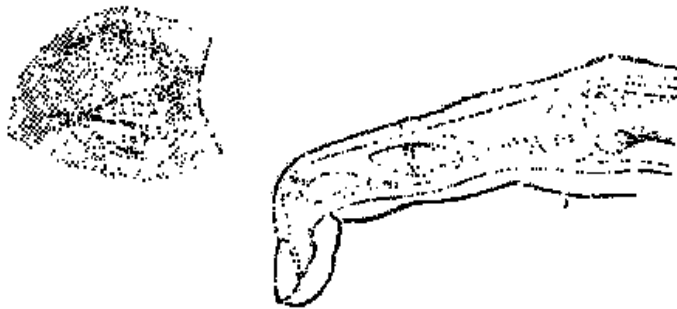
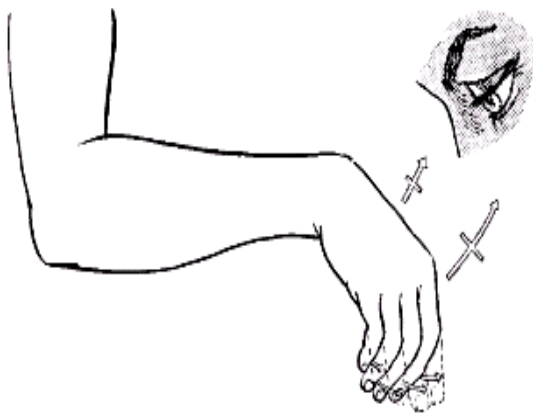


Fig. 69. Extensor tendon injury in the distal interphalangeal joint.

At examining the nervous function attention should be paid to the following:

- whether sensitivity is affected and / or motor area?
- at what level is the damage located?

At high (proximal) injury both sensitivity, and motor function suffers.



Мал. 70. **The wrist drop in case of radial nerve paresis:** lack of extension in the radial wrist and metacarpophalangeal joints. Preserved extension in the proximal and distal interphalangeal joints.

*The prolapse of the radial nerve* leads to a "wrist drop " (Fig. 70), if the nerve is crossed before the return of motor fibers to the extensor muscles. Because these fibers extend immediately distal to the head of the radial bone, the development of the characteristic pattern of the nerve must be crossed just below the elbow joint or above it. Sensitive nerve fibers pass on the wrist in the fold of the superficial branch, extending in the area of the elbow joint from a purely motor deep branch. Therefore, the injury of the radial nerve will be accompanied by the loss of sensory and motor function if it is located above the elbow joint. Loss of only sensitive function occurs when the injury is in the forearm, and purely motor – when injury is in the head of the radial bone. It is typical for a wrist drop that extension in the carpometacarpal and metacarpophalangeal joints becomes impossible, and extension in the proximal and distal interphalangeal joints may be maintained due to the red and interosseous muscles innervated by the median and ulnar nerves. The lack of extension and removal of the first finger is noted by the accelerated check (fig. 71).



Fig. 71. **Accelerated test for paresis of the radial nerve:** no extension and removal of the thumb.

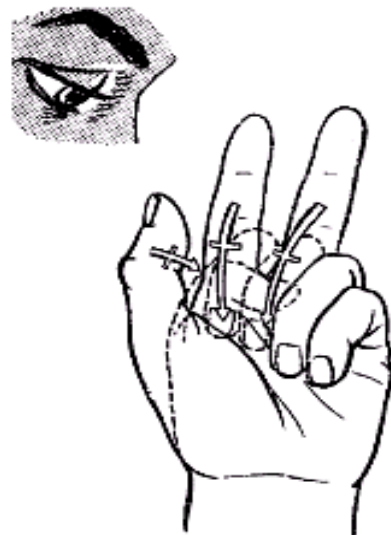


Fig. 72. **"Wrist of a praying person"** in case of the new or old paralysis of the median

When the *median nerve is injured*, the flexor of the fingers, located on the radial side, loses its function. There is no flexion in the distal and proximal interphalangeal joints of II and III fingers, as well as in the interphalangeal joint of the thumb. This leads to the formation of a "praying wrist" (Fig. 72). However, extension in the proximal and distal joints, despite the paralysis of the appendix

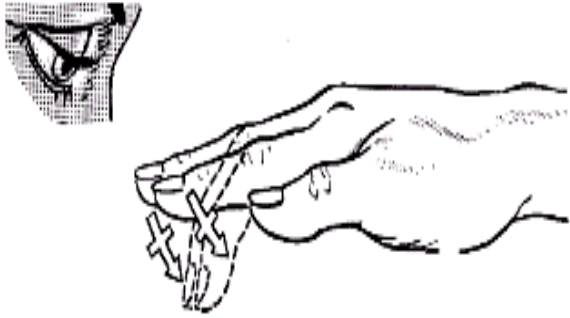


Fig. 73. "Monkey wrist" in case of the old paralysis of the median nerve.

muscles, is still possible due to the interosseous muscles, innervated by the ulnar nerve; simultaneous paralysis of the muscle of the first finger leads to its vicious position in old injuries, so it remains in the same plane as the other fingers. This vicious position is called the "monkey wrist ". The typical position of the nail plate and the finger, which changes from radial to dorsal (Fig. 73).

muscles, is still possible due to the interosseous muscles, innervated by the ulnar nerve; simultaneous paralysis of the muscle of the first finger leads to its vicious position in old injuries, so it remains in the same plane as the other fingers. This vicious position is called the "monkey wrist ". The typical

In doubtful cases it is possible to specify the diagnosis by means of the accelerated test: it is impossible to touch pads of I and V fingers because of absence of a palmar assignment and opposition of the I finger (fig. 74).

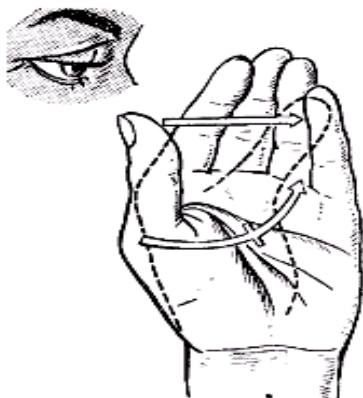


Fig. 74. Accelerated test for paresis of the median nerve.

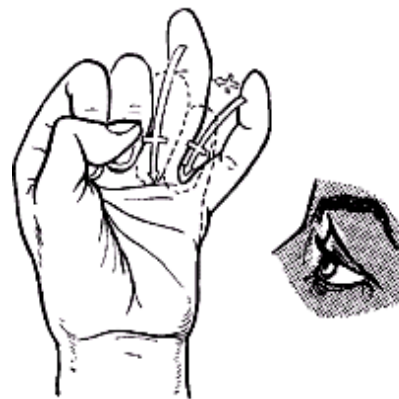


Fig. 75. "Claw" wrist in paresis of the ulnar nerve.

High paralysis of the ulnar nerve causes a lack of flexion in the proximal and distal interphalangeal joints of the IV and V fingers with the formation of a "bird's paw" (claw). It is impossible to bring the little finger due to paralysis of the interosseous muscles. At an old injury the muscular atrophy between IV and V metacarpal bones, and also between a thumb and II metacarpal bone is expressed (fig. 75).

The **spine** normally has natural curvatures: minor cervical lordosis, thoracic kyphosis, lumbar lordosis and sacral kyphosis. Pathological position of the upper arms and pelvis, incorrect head position or displacement of the waist triangle to one side may indicate a pathological curvature of the spine. Examination will reveal scoliosis, excessive kyphosis (round back), abnormal straightness (flat back) and hump. Curvature of the spine to the side is called *scoliosis*, curvature of the convexity behind – *kyphosis*, convexity forward – *lordosis*. Combinations of spinal curvatures, such as *kyphoscoliosis*, are common. Peculiarities of the patient's posture, in particular severe thoracic kyphosis, in combination with smoothing of lumbar lordosis and limited mobility of the spine (the patient's torso is fixed in the forward bending position, which creates a peculiar posture – "*beggar's posture*") make possible to diagnose *ankylosing spondylitis* (*Bechterev's disease*).

The volume of movements of a backbone is important. Restriction of flexion can be detected by the distance "*fingers - floor*" (Fig. 76). Normally, when leaning forward with outstretched arms, a person can touch the floor with his/her fingertips or almost get it. If this distance remains large, the flexion in the spine is limited. The specified distance is measured in centimeters. With the help of *Schober's sign* it is possible to differentiate restrictions of bending in lumbar and thoracic departments of a backbone: in the straightened position of the patient mark a pencil, one at the level of a backbone S1, and the second – 10 cm above. The same is done over the condyle of the C7 spine and 30 cm below it (Fig. 77a). When leaning forward, the distance in the lumbar region normally increases by 5 cm, and in the thoracic region by 8 cm. When it is difficult to bend, these distances will be correspondingly smaller (Fig. 77 b). Checking the inclination to the sides is

performed in the position of the patient standing (preferably in the lumbar region). Overextension is also checked in the position of the patient standing and additionally lying on his stomach.

At examination of the rotational movements – fix a pelvis in the position of the patient standing or sitting, and at examination in cervical department of a backbone – fix a shoulder girdle. Tight mobility or immobility in various parts of the spine is due to organic changes in the skeleton, neurogenic or reflex muscle contracture.

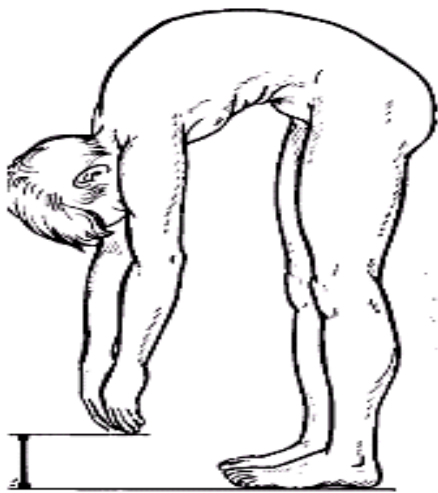


Fig. 76. **The distance between the fingers and the floor when limiting the flexion of the spine.** The black bar equals the distance between the fingertips and the floor.

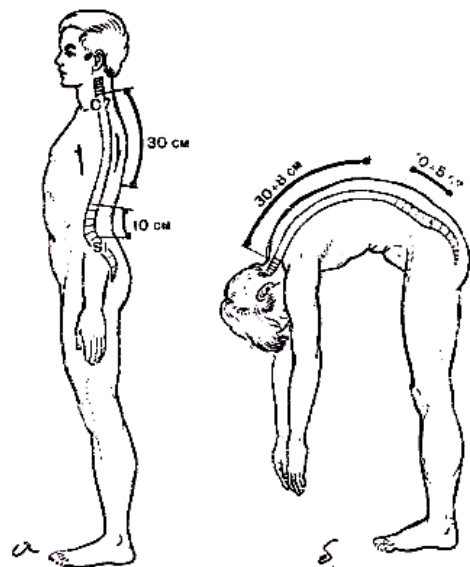


Fig. 77. **Schober's sign** for the recognition of flexion in the thoracic or lumbar spine.

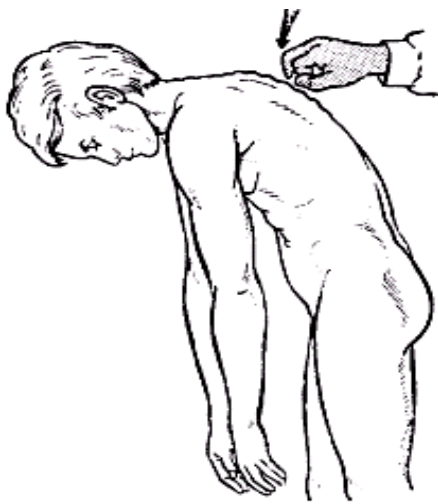
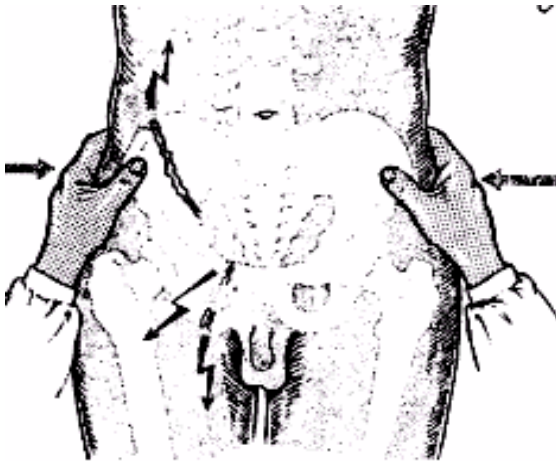


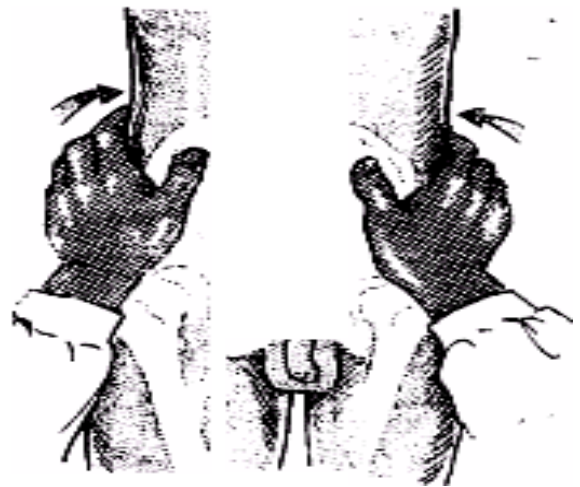
Fig. 78. **Palpation and percussion of the spinous condyles with a slightly curved spine.**

By means of the palpation and tapping of spinous condyles (fig. 78) their morbidity, and also a tone and morbidity of white vertebral muscles are checked. Transmissible back pain can be caused by pressure on the head in a corrected position: the doctor stands behind the patient, puts his/her folded arms on his/her head and puts pressure in the vertical direction.

Transmission pain is also caused by falling from tips to heels (pain from falling on heels). In the spinal joint, the pain is checked by direct pressure and tapping. Transmission pain can be caused by the compression on the sides and in the sagittal plane (Fig. 79, 80).

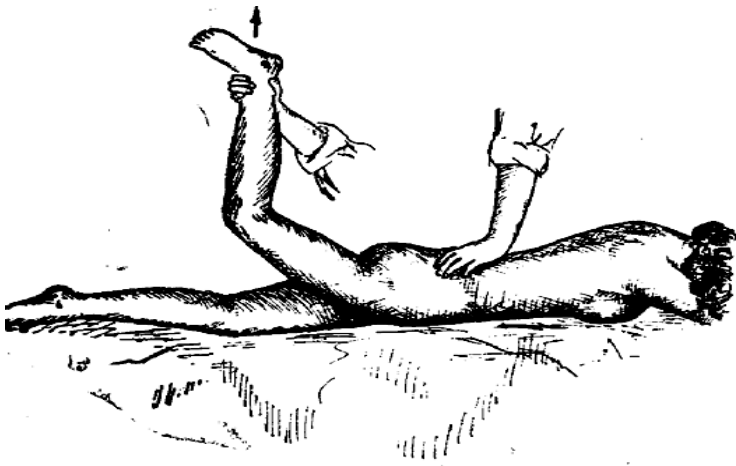


**Fig. 79. Lateral transmission pain when the pelvic ring is fractured.**



**Fig. 80. Transmission pain in fracture of the iliac bone.**

Flexion in the hip joint in the supine position or on the abdomen with the injury of the vertebral joint, there is pain in it (Fig. 81).



**Fig. 81. Extension in the hip joint.**

If a new trauma (fig. 82) of a backbone is suspected, the patient is appointed absolute rest. Checking the pain – pressing and tapping, in the position of the patient on his/her back or sometimes on his/her side.

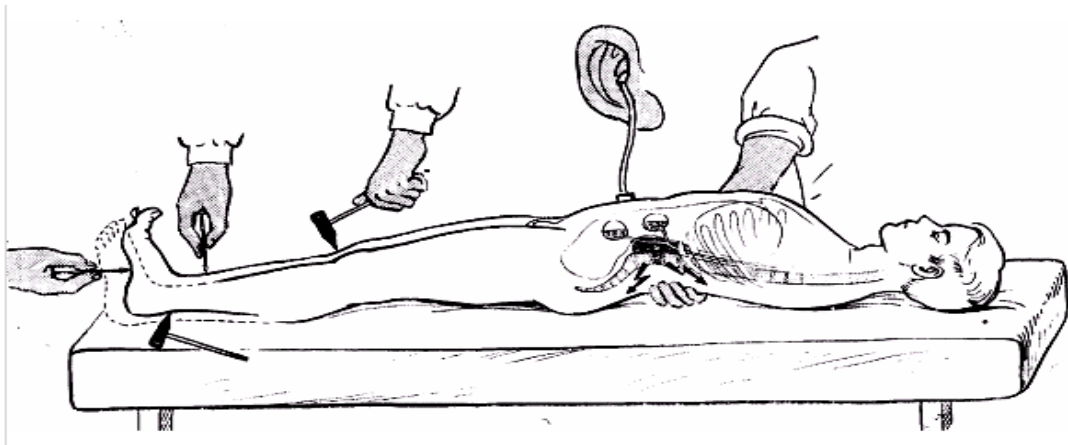


Fig. 82. **Fresh spinal cord injury.**  
The examination is performed in an unbent position lying down

**Stable fractures** (intact vertebrae) can be recognized by pain from pressure, sometimes hematoma. At a **compression fracture** of a vertebra in the form of a wedge it can be felt as a small hump. **An unstable fracture** (torn longitudinal ligament) is characterized by the additional formation of a gap between two separate condyles. At a **dislocation** there is a step. Dislocation most often occurs in the cervical spine and at the junction of the thoracic and lumbar.

Fracture of the **pelvic bones** can be detected by transmission pain with lateral or transmission load (Fig. 79, 83). Pressing on the wings of the pelvis laterally and posteriorly they can also be painful (Fig. 80). At a fracture of shin bones, a rupture of a symphysis and a fracture of a hip cavity there are quite often injuries of a bladder and an urethra.

Pain in the hip joint occurs in nonspecific and tuberculous coxidirosis. With every disease of the hip joint, it should be remembered that it can cause pain in the knee joint, which is why pain in the knee joint is often the first symptom of coccyx. Examination of the hip joint is done in the position of the patient standing behind, sideways and in front. Evaluate the symmetry, pelvic tilt and muscle relief. At the same time pay attention to the shape of the buttocks.

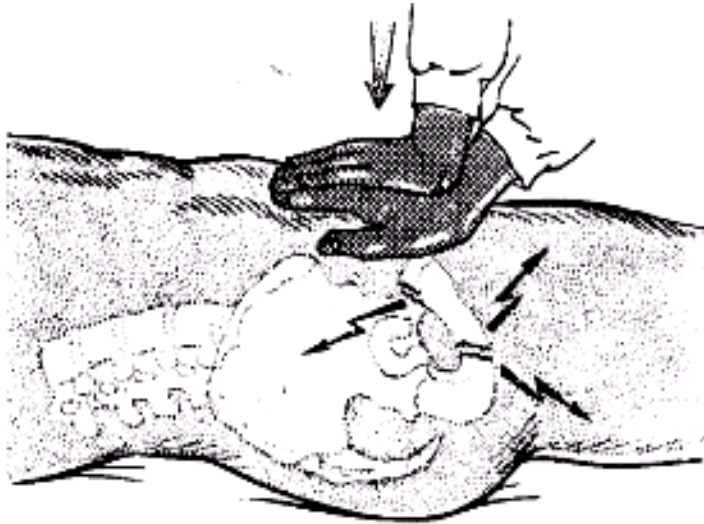


Fig. 83. Anterior-posterior transmission pain in fracture of the pubic bone.

When walking with the help of a rear view, it is possible to establish lameness, which happens:

- *lameness of Duke-Trendelenburg*;
- *lameness due to shortening*: excessive tilt of the torso towards the shortening and excessive bending of the knee on the healthy side;
- *lameness due to pain*: reducing the load time on the affected limb or slowing down due to a careful onset and tearing of the foot;
- *lameness due to ankylosis*: ejection of the limb with rotation of the entire pelvis;
- *lameness due to paralysis*: switching on unparalysed muscles when walking or grotesque uncoordinated gait.

**Trendelenburg sign** is checked as follows: the patient in turn stands on each leg (fig. 84 a, b), thus on the side of the lifted leg the crest of an iliac bone rises. If it goes down – the symptom is considered positive. By moving the upper torso, alignment can be achieved (**Duke's sign**). In this regard, the doctor should pay attention to the vertical axis of the torso. The combination of both symptoms when walking is the lameness of Duke-Trendelenburg. This deviation is due to the fact that the middle gluteal muscle on the affected side is not able to hold the weight.



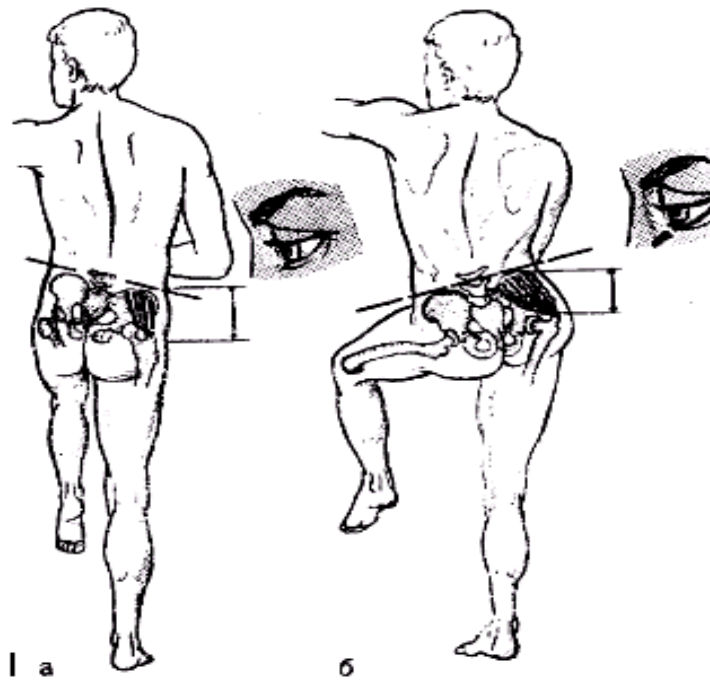


Fig. 84. **Trendelenburg sign.**

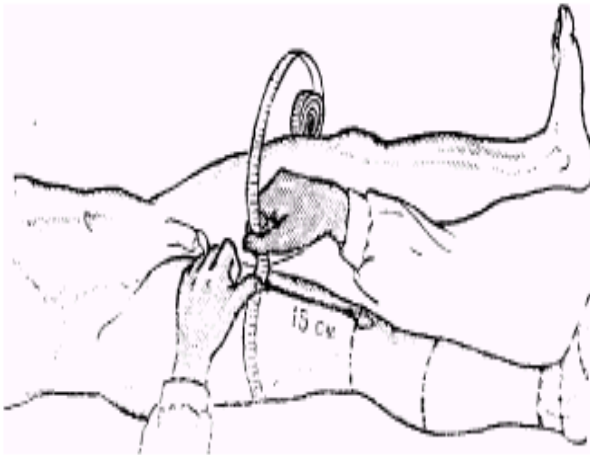
a - standing on one leg, the pelvis rises on the opposite side with sufficient function of the middle gluteal muscle. The black line is equal to the length of the muscle between the crest of the pelvis and the top of the large collar; b - in case of insufficiency of the middle gluteal muscle, the pelvis descends to the healthy side while standing on one leg. The black line is equal to the reduction in muscle size.

The reason for this insufficiency may be their paralysis, but more often there is a shortening of the lever due to changes in the skeleton (ankylosis coxa vara, shortening of the femoral neck, fracture, instability in dislocation and subluxation of the thigh). By means of a palpation the swelling and soreness of an articular capsule in front under a puparny number and at once outside from a femoral artery is established. The part of the femoral head that lies outside the vertical cavity is accessible by direct palpation. When rotating the leg, it is also possible to determine the crepitation. The absence of the head at this point indicates a dislocation of the thigh.

Comparative measurement of the length of the leg from the anterior upper concave spine to the internal cleft allows to judge the shortening or lengthening, and the measurement of the circle of atrophy (Fig. 85). When measuring the length, you should pay attention to the horizontal position of the cape and the straight axis of the leg (Fig. 86).

Mobility testing includes the amount of active and passive movements. First, the adduction and the reduction of the straight leg are examined. In order to ensure the check in the same plane, lift the opposite leg (Fig. 86) and at the same time

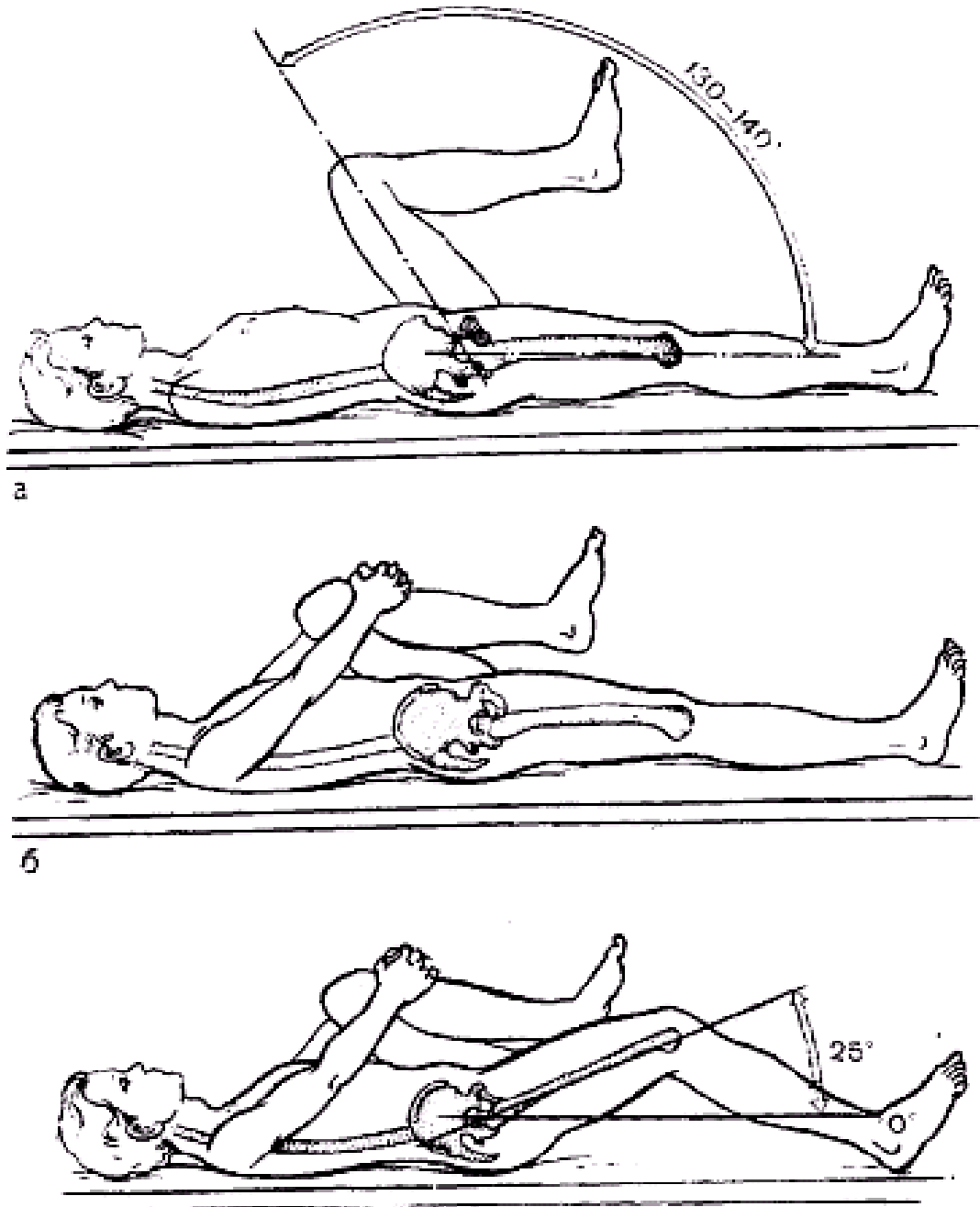
hold the cape with the other hand, thus eliminating its auxiliary movements. Flexion and extension are checked on the outstretched leg, first in the position of the patient on his/her back, and then lying on his/her stomach (Fig. 87 a-c). In the same positions of the patient external and internal rotations are checked (Fig. 88 a-g). During the examination, carefully monitor the position of the examiner's hands and the keeping the longitudinal axis of the thigh (neutral - zero method).



**Fig. 85. Measurement of a circle in case of the atrophy of a leg:** comparative measurement 15 cm above the top edge of a patella or 10 - 20 cm above the crack of a knee joint from an internal surface; above the middle of the patella; above the largest volume of the calf muscle or 25 cm below the crack of the knee joint from the inner surface; over the thinnest place of the foot; above the foot.



**Fig. 86. Checking the movements in the hip joint:** abduction and reduction. The opposite leg is raised and the pelvis is fixed to the table.



**Fig. 87. Checking the movements in the pelvic-femoral joint: flexion and extension in the position of the patient lying on his/her back.**

a - measurement of the volume of movements by the neutral - zero method; b - full extension: Thomas's sign is negative (explanation in the text); c -in flexion contracture up to 25 °: Thomas's sign is positive (explanation in the text)

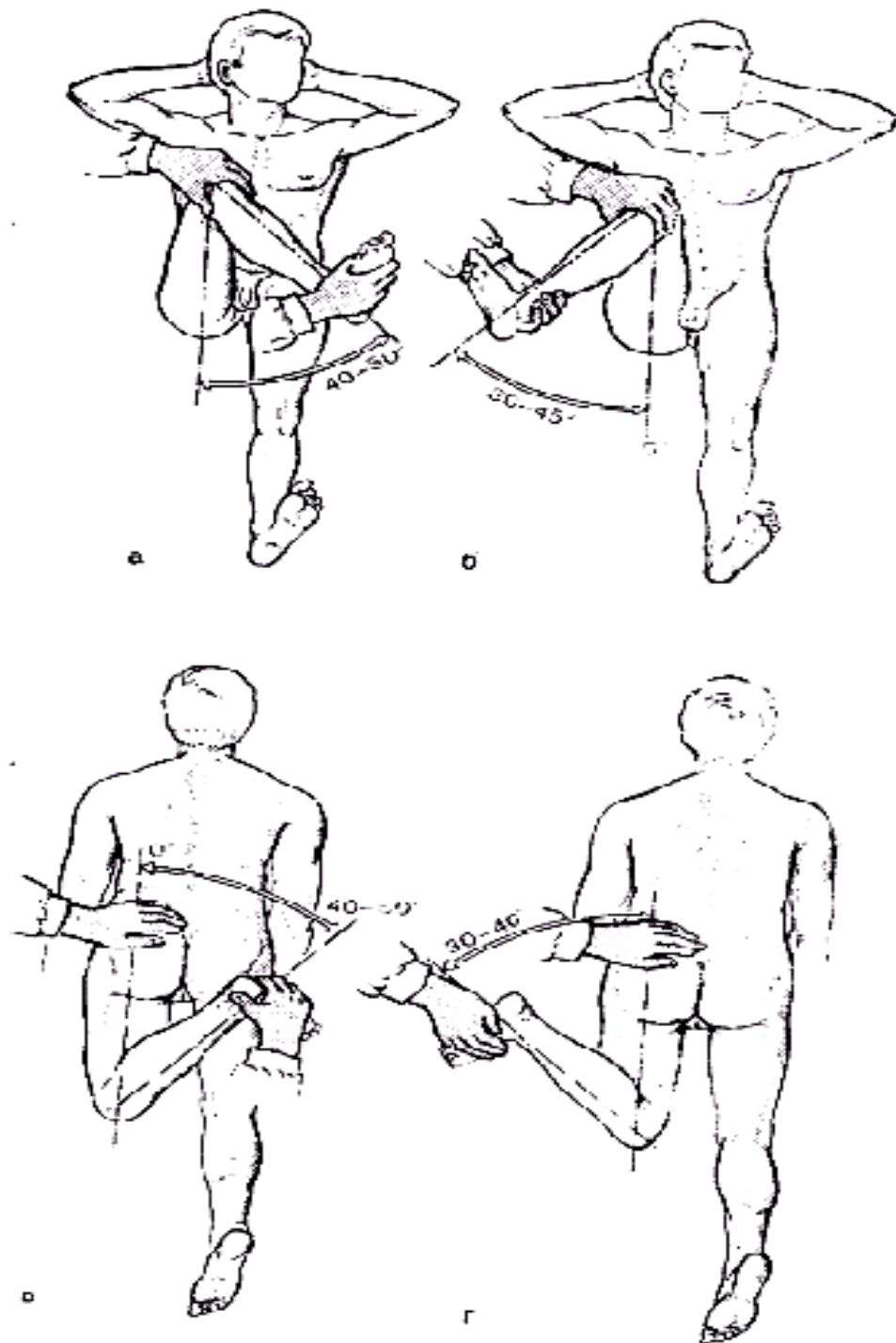


Fig. 88. Check the external and internal rotation.

The amount of movements in the joints is measured by the neutral - zero method using a special protractor. An axis is made for each joint, when measuring the rotation point of the protractor must exactly coincide with the axis of the

rotation of the joint, it does not matter whether there will be movement in the sagittal, frontal or transverse planes.

In the neutral-zero method, the deviations of active and passive movements are checked and expressed as “restrictions on 1/3, 2/3 or 1/2” in relation to the healthy side.

In the "neutral-zero method", all movements in the joint are measured from a single set zero position (Fig. 89). The joints of an upright healthy person take zero position, if the legs are parallel, outstretched arms lie along the torso, thumbs are bent. Movement in the joints is done in the sagittal, frontal and transverse planes and by rotation. Passive and active movements are recorded in three digits: the first indicates the movement in the direction from the torso (extension, abduction, external rotation); the second corresponds to the original zero position. If it does not change during movements, then zero is placed in the place of the first or third digit, regardless of how the zero position will not be achieved during movements directed from the torso or to the torso. The third digit gives the volume of movements towards the torso (flexion, reduction, internal rotation).

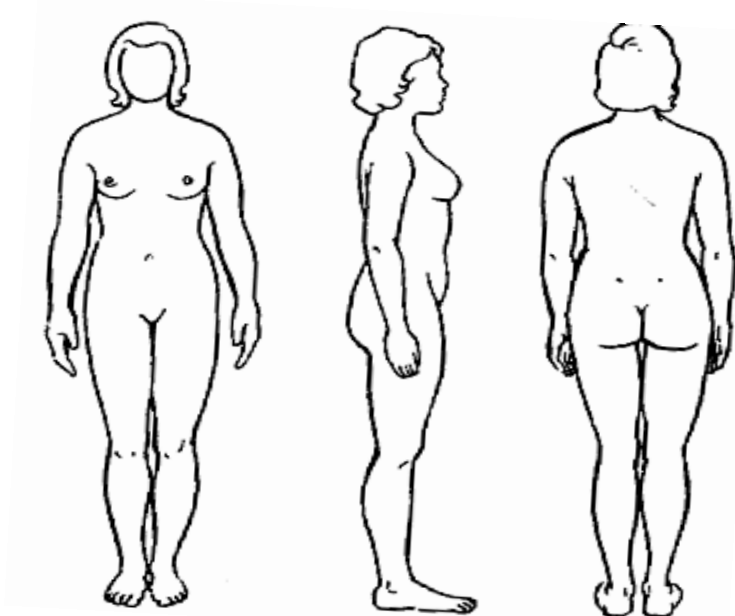


Fig. 89. **Neutral-zero method for measuring joint function:** zero position of joints in direct and lateral projections.

**Example:** normal knee joint: 5/0/130°, which corresponds to the extension to 5° of the normal initial zero position and flexion to 130°. Limitation of the

extension in the knee joint:  $0/20/180^\circ$ , which means that the initial zero position is not achieved both in extension and in directions coming from the torso, that the initial position lags behind zero by  $20^\circ$  and directed to the torso flexion is possible up to  $130^\circ$ . Ankylosis of the knee joint:  $0/20/20$  corresponds to the stationary position of the joint when bending is at an angle of  $20^\circ$ . The zero position is not reached during the extension, the initial position is  $20^\circ$  and further bending is impossible, in other words, the ability to bend does not exceed  $20^\circ$ .

Limited extension of the thigh can be aligned in the supine position of the patient due to hyperlordosis in the lumbar spine. This "empty waist" can be seen and felt. If now the patient with both hands pulls the knee of a healthy leg to the torso to the maximum flexion of the hip joint, then the lordosis in the lumbar spine will disappear and there will be a lack of extension of the patient's thigh (*Thomas*). Conversely, you can increase lordosis in the lumbar spine, if the thigh, which is not fully extended, pressed to the table.



Fig. 90. Fracture of the femoral neck through the swivel.

In case of a fracture of the femoral neck, the limb shrinks and returns to the outside. At considerable reduction besides there is its reduction (Fig. 90). These symptoms are all the more pronounced the farther from the femoral head to the fracture. Thus, they are most pronounced when broken through a swivel. The patient cannot actively lift the straightened leg from the bed (symptom of a sticky heel). This can also be confirmed by the classic symptoms of

bone fractures: the pain is constant and strictly localized. Bending pain is typical. Axis offset: sideways, at an angle, rotation. Swelling: a hematoma appears at the fracture site. Pathological motility and crepitation are checked as necessary.

The bruised medial fracture of the femoral neck does not lead to limb contraction and is accompanied by only a slight external rotation. Often the patient can walk. Pain at loading and restriction of movement causes suspicion which is determined by X-ray examination.

The separation of the large swivel leads to the lameness of Duken-Trendelenburg and local pain. Outside the load, the leg is brought and rotated inward. At separation of a small turn the patient cannot lift a leg more than at a corner of 90 degrees, in a standing position.

Hip dislocation is diagnosed by general symptoms: joint deformity, pain and swelling. The main symptom is a violation of the continuity of the articular axis; which leads to incorrect standing, as well as to elastic fixation. The doctor presses on the dislocated limb as soon as the pressure stops, the limb, like a spring, takes the old wrong position. It is called a *sign of elastic fixation*.

Dislocation of the thigh to the buttocks is more common than the front: it

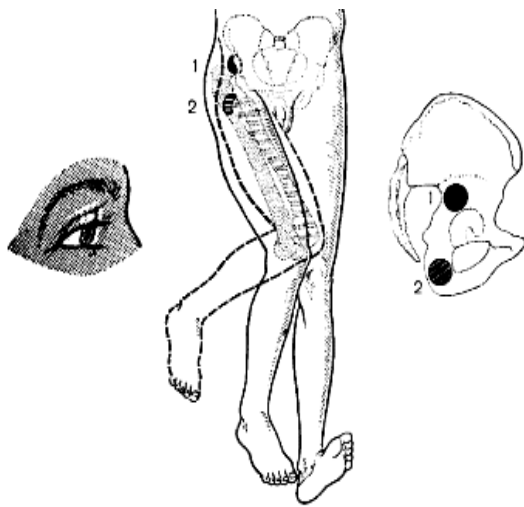


Fig. 91. **Posterior dislocation in the hip joint.** **The leg is turned inwards.** 1 - spiritual dislocation: moderate flexion of the knee joint (most common); 2- gluteal dislocation: strong flexion in the knee joint (liquid).

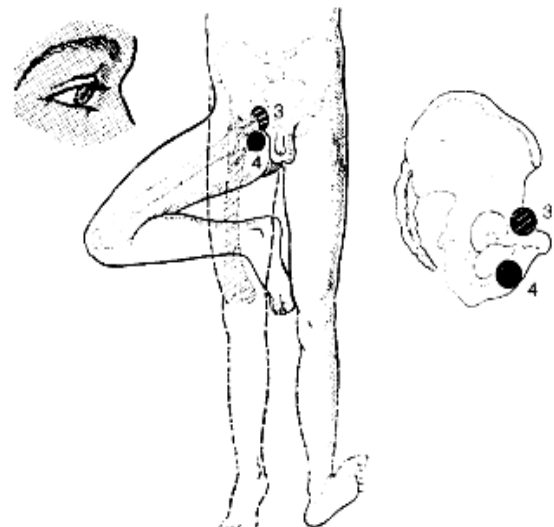
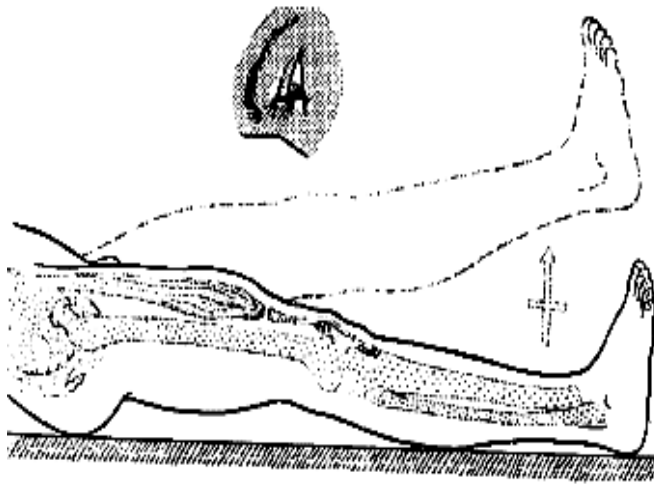


Fig.92. **Anterior hip dislocation.** The leg is turned outwards. 3-subcutaneous dislocation. Leg in the extension position (very rare); 4- closing twist. The knee joint is strongly bent (rare).

refers to the rotating limb inward. At a spinal dislocation the knee joint can be moderately, and at a sciatic dislocation, on the contrary, strongly bent (Fig. 91). Anterior dislocation gives external rotation: at suprapubic dislocation the knee

joint is unbent, and at closing – severely bent (Fig. 92). Posterior dislocations are often accompanied by a fracture of the posterior edge of the acetabulum, so it is necessary to conduct an X-ray examination. With posterior dislocations, the sciatic nerve is often injured.

A hip fracture provides similar typical fracture symptoms. At a distal fracture there is a shift of a distal fracture to a back because of draft of calf muscles. This poses a threat to blood vessels and nerves.



**Fig. 93. Damage to the extensor apparatus.**

You cannot actively lift the calf from the stand. The most common causes are rupture of the rectus femoris, fracture of the patella, rupture of the tendons of the patella or the humerus of the tibia.

At examination of soft tissues it is necessary to remember about a rupture of a tendon of a quadriceps muscle (Fig. 93).

**The knee joint** consists of a durable ligament that holds two bones together. Due to the complex rotational movements and movement of the connecting structures, the weight of the body is transferred from the oblique axis of the thigh to the vertical axis of the shin. Due to this, a straight course is possible.

During the examination, attention is paid to the contours of the joint (normal, smoothed) (Fig. 74, 75). with a chronic inflammatory process, and rough – with the progression of the disappearance of cartilage. There is a positive symptom of "swamp patella": on the right knee with the left hand, and on the left knee with the right hand it is necessary to squeeze all the fluid from the upper torsion in the horizontal direction down under the patella. thighs and floats in the articular effusion, now pressed ventrally to the knee in a cup with the other hand. After the pressure ceases, the patella returns to its old place (Fig. 76). By means of



a puncture and aspiration of liquid it is possible to distinguish a raw exudate from purulent or bloody. All damages of the extensor apparatus lead to the impossibility of the extension and active raising of a shin from the stand, Fig. 94.

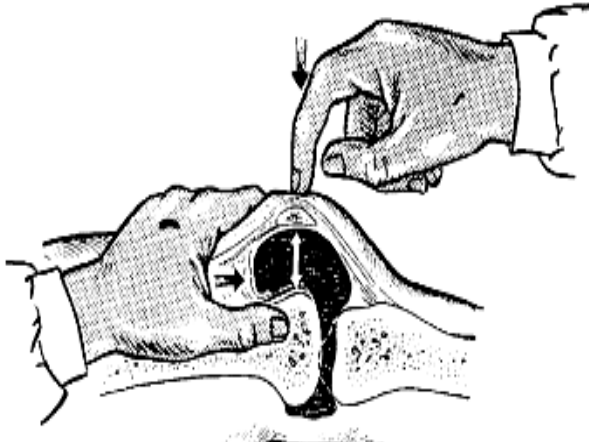


Fig. 94. **Exudation in the knee joint.**

of the knee during this movement causes a restriction of the meniscus between the articular surface of the tibia and the click of the thigh. Damage to the menisci makes it difficult to stretch. True blockade is characterized by some limited time.

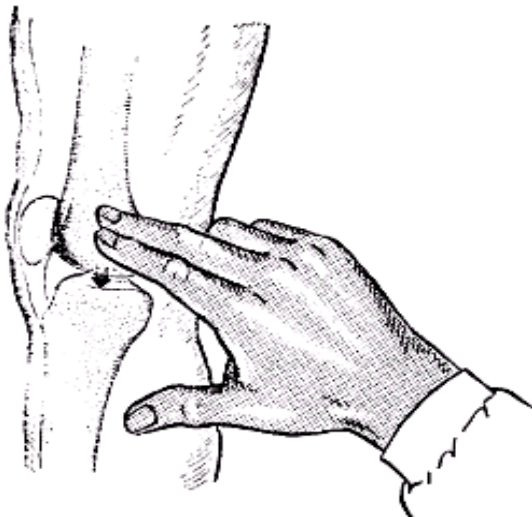


Fig. 95. **Palpation of the knee joint.** A slit that runs across the joint is easy to find if palpated with the finger pushed down from the inner click of the thigh by 1 - 2 cm.

direction to the site of the tibia. By moving the fingers horizontally, you can feel the joint space directly above the edge of the site of the tibia (Fig. 95).

Damage to the inner meniscus is more common than to the outer one. Trauma predominates in young patients, and degenerative causes in elderly patients. A typical mechanism of injury consists of a sharp rotational movement: the rotation of the body with a bent knee joint and a fixed shin. Sudden extension

After its disappearance, the knee joint is fully extended again. Clamping with pain occurs when turning or abruptly getting up, "clicking" has diagnostic value only when it is accompanied by pain. If rupture of the meniscus is suspected, attention should be paid to the limitation of extension and the smoothness of the contours of the joint.

During palpation, a joint gap is found. To do this, two fingers are placed to feel the click of the thigh. Then move the fingers in the distal

In the position of the extension of the joint, a painful point is found, after which the patient is asked to bend the knee. Noting a painful point on the knee, this point is found again. If it is moved to the buttocks, it indicates damage to the meniscus (Fig. 96 a-d).

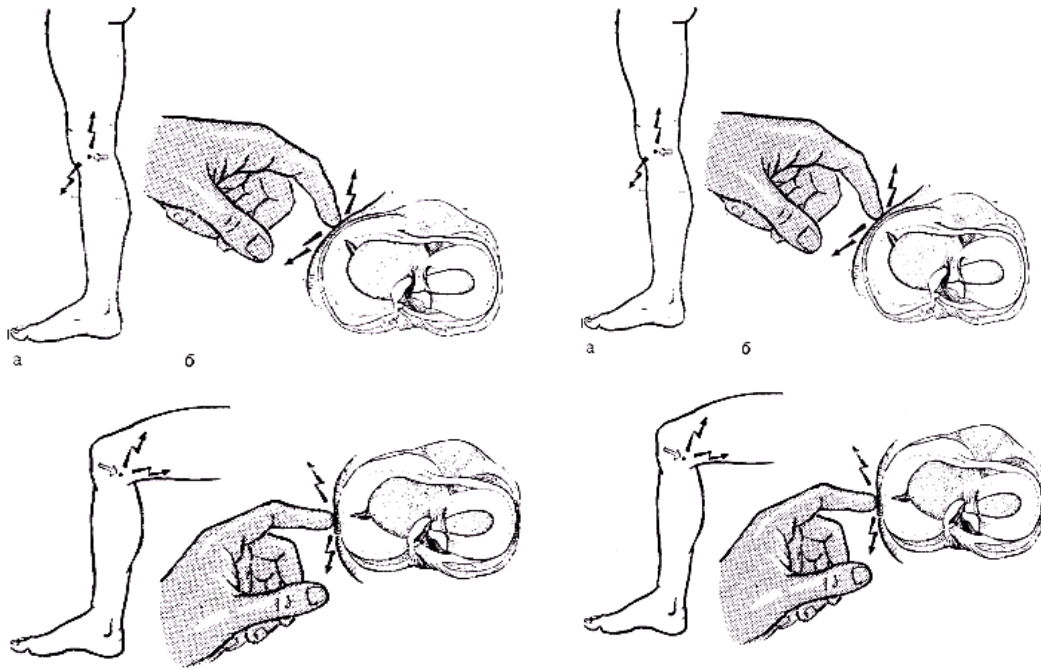


Fig. 96. **Steiman's sign - II at meniscus damage:** a - a painful point in a crack of a knee joint at the bent joint; b - palpation of the painful point schematically; c - when bending the knee joint, the painful point moves backwards; d - palpation - schematically.

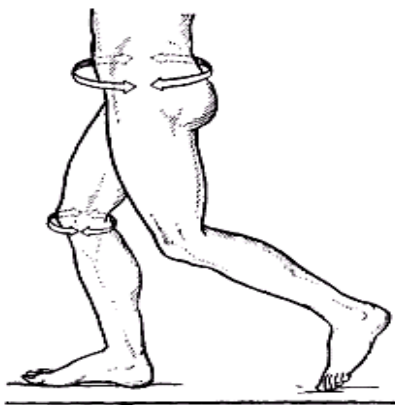


Figure 97. **Merke's sign.**

The symptom of the local pain in the damaged meniscus can be caused by a number of techniques that are formed in the knee joint (pain during rotation). The patient gets up and raises a healthy leg. Painful external rotation indicates damage to the posterior horn of the internal meniscus, internal rotation – damage to the anterior horn of the internal or external meniscus, depending on where the pain will be localized (Fig. 97).

When the meniscus is damaged, forced flexion of the knee joint (Fig. 98) causes pain - a frequent and characteristic symptom. *Paier's sign* is characterized

by pain from pressure. At the same time the patient takes the *position of the tailor*, the doctor presses on the top on the stretching knees, pressing legs to a support. When the internal meniscus is damaged, such pressure is accompanied by pain.

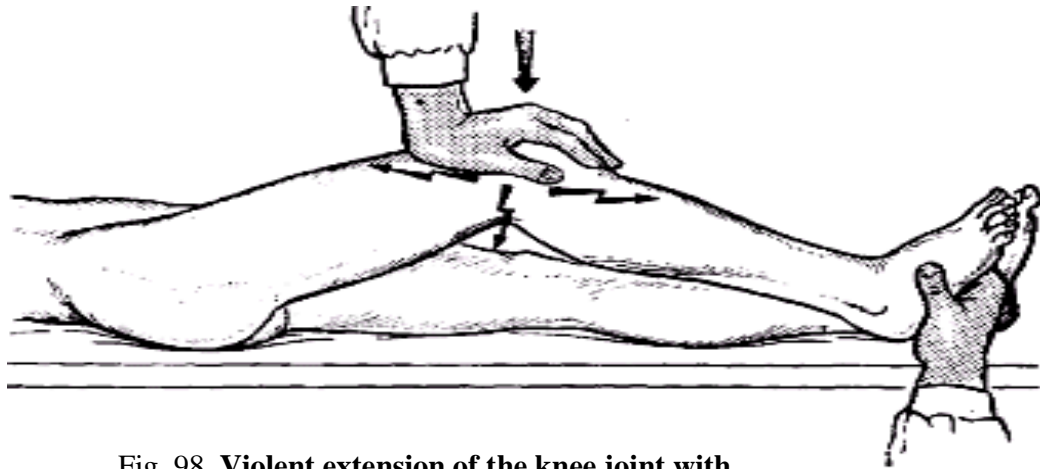


Fig. 98. Violent extension of the knee joint with meniscus damage causes pain.

**McMurray test** is used to determine the location of the meniscus rupture. The patient's leg is bent as much as possible and the knee is held with one hand, the foot is grasped with the other hand and the shin is rotated outwards when the internal meniscus is suspected to be ruptured or inwards when external damage is suspected. After the rotation of the leg is stretched, while the torn part of the meniscus slips out from under the click of the thigh, causing a click. The more the damage is behind, the earlier, ie in a more bent position, there is a click.

**Injury of ligaments.** The articular capsule, lateral ligaments, and cruciate ligaments are a functional unit. Together they provide stability and variety of movements. The cruciate ligaments stabilize the tibia in the anteroposterior direction. In addition, the front cruciform row prevents excessive external rotation, and the rear - forced internal rotation. **Romy's sign** is a sign of the damage to the cruciate ligaments of the knee joint: with a bent knee joint, the shin is removed forward if the anterior ligaments are injured, or posteriorly if the posterior ligaments are injured. The anterior cruciate ligament ruptures more often during forcible removal, a precondition for their rupture is a strong overstretching or rupture of the internal lateral ligament. But a direct blow to the thigh can also rupture the anterior cruciate ligament as a result of a sudden rearward displacement

of the thigh with a bent knee joint and a fixed shin. On the contrary, a strong direct blow to an unloaded shin with a bent knee joint leads to a rupture of the posterior cruciate ligament (a blow to the shin of a football player preparing to kick a flying ball; a blow to the shin in the event of a sudden loss of speed during a car accident). More often there are combined injuries as a result of forced rotational movement at the bent knee joint (medial rupture at excessive rotation of a shin of skiers). If the internal lateral ligament, the anterior cruciate ligament and the internal meniscus are torn at the same time, it is an "unfortunate triad".

When a lateral ligament ruptures, a hematoma forms at the rupture site. Ruptures most often occur at the site of the proximal attachment of the ligament to the condyle of the thigh. A large rupture with damage to the capsule and rupture of the cruciate ligament can establish the displacement of the axis of the tibia. When

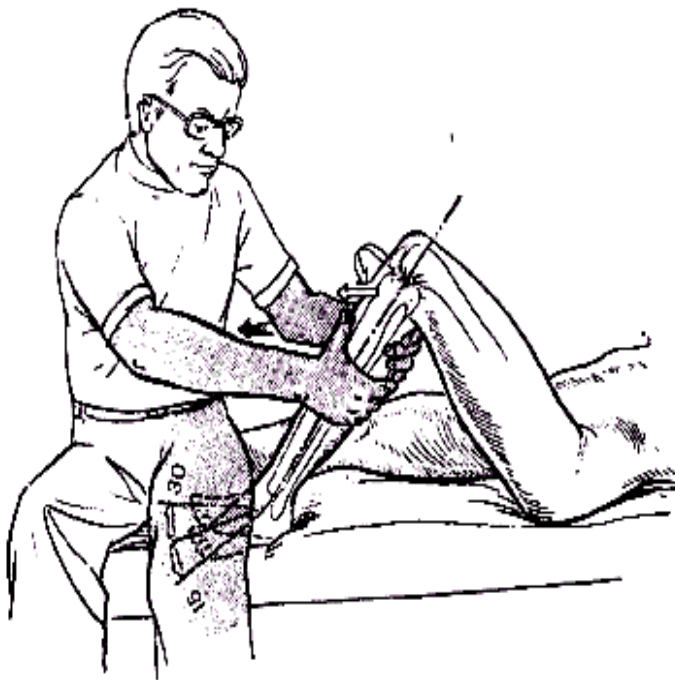


Fig. 99. Sign of a "rotary drawer".

the posterior cruciate ligament ruptures, a displacement of the humerus of the tibia can be seen posteriorly compared to the healthy side in a supine patient with slightly bent knees. In contrast, the rupture of the anterior cruciate ligament remains invisible. A complete rupture of the lateral ligament allows you to feel the failure, especially when checking the joint for openness. Of the

functional tests, the most significant is the detection of the symptom of "rotary drawer" (Fig. 99).

A positive sign of the outer drawer is the rupture of the posterior-outer capsule, the outer lateral and posterior cruciate ligaments. The sign of a rotating drawer should be supplemented by checking the joint openness. It is checked by holding

the thigh with one hand and grasping the shin with the other hand to bring it in or out. With a straightened shin, its increased valgus position will only be possible when the posterior ligament and joint capsule are torn. The average most important portion is checked in the same way, giving the leg a position of easily bending to an angle of 30 degrees. (Fig. 100 a, b).

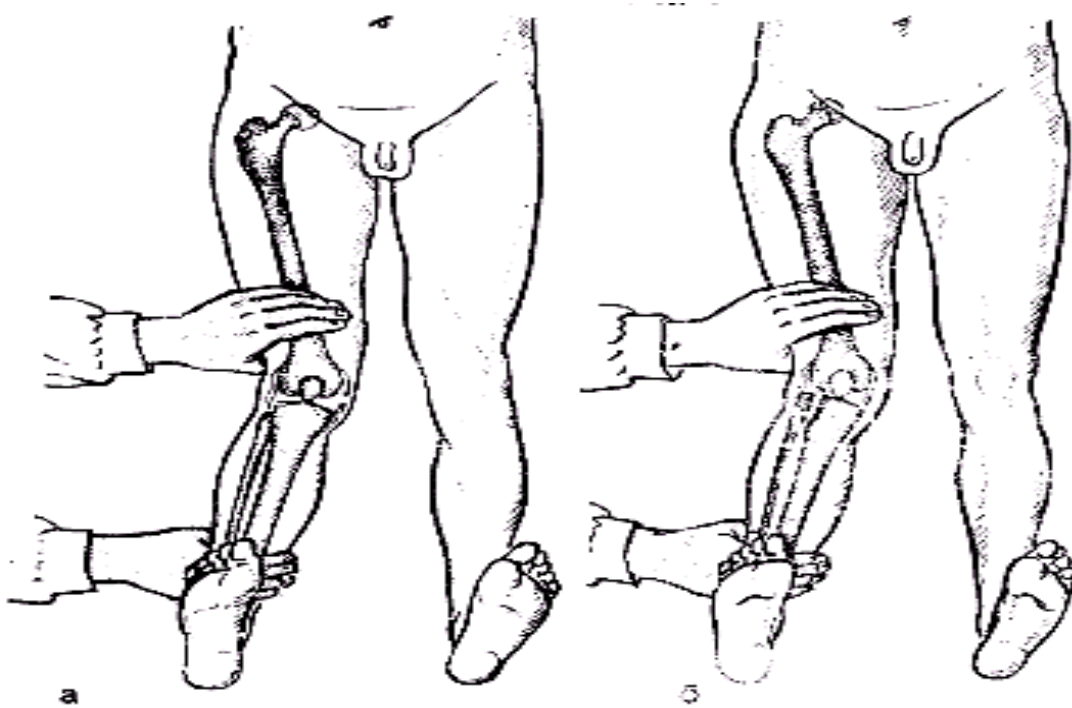


Fig.100. Straightening of a knee joint on an internal surface in the position of full extension: a - at full rupture of an internal lateral row; b - when breaking the outer edge of the head of the tibia.

The "*drawer phenomenon*", a characteristic symptom of cruciate ligament rupture, which is tested separately, loses its significance when a symptom of a rotating drawer is detected. Carrying out this test requires complete relaxation of the extensor apparatus, which can be achieved if the patient sits on the edge of the table and hangs his/her legs. The tibia is grasped with both hands just below the knee joint and pulled forward or pushed backwards (Fig.101 a, b).

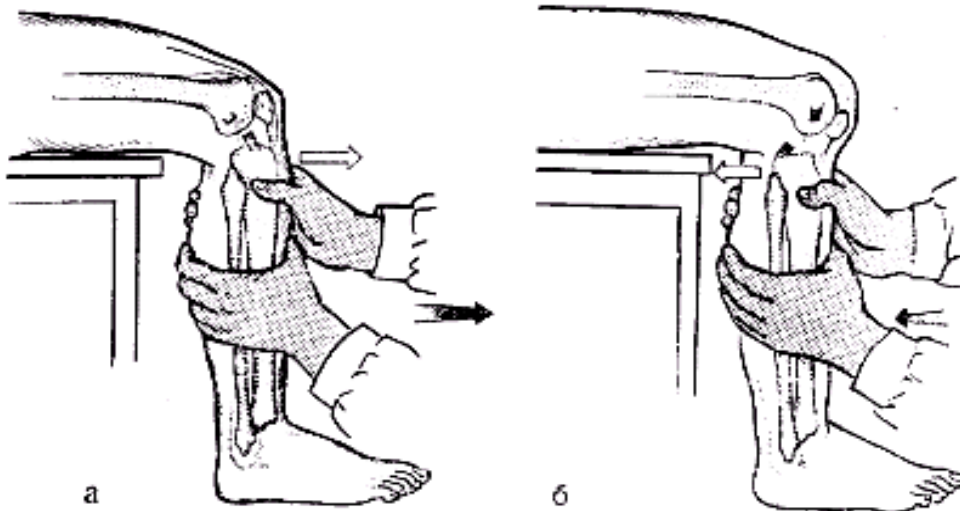


Fig. 101. The phenomenon of the drawer after the rupture of the cruciate ligaments: a - anterior extension - the anterior cruciate ligament; b - posterior extension - posterior cruciate ligament.

Excessive forward movement indicates a rupture of the anterior cruciate ligament, and a clear shift backwards indicates a rupture of the posterior cruciate ligament. These data should be evaluated carefully, because with a weakened and atrophied extensor apparatus will not be an important factor in stabilizing the knee joint and mobility will be facilitated. Shifting the tibia back when the posterior cruciate ligament ruptures may mimic the symptom of the anterior drawer. Among inflammatory diseases bursitis (inflammation of the mucosa of the joints) is often

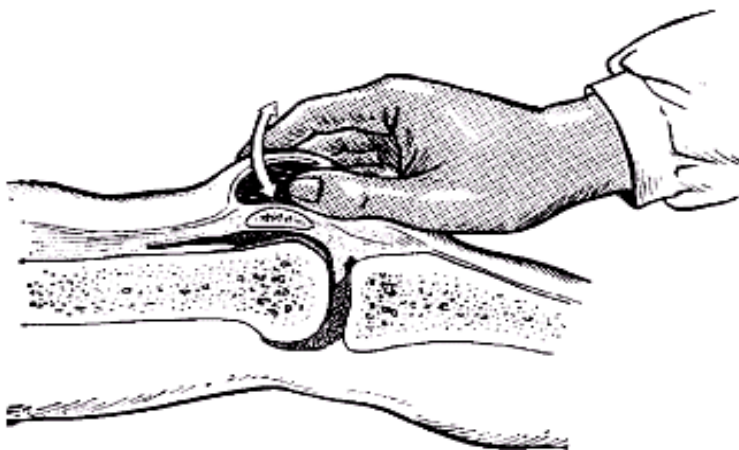


Fig. 102. Prepatellar bursitis.

observed. The most commonly affected prepatellar mucosa is prepatellar bursitis, which is easily diagnosed. It has a noticeable swelling over the patella (Fig. 102). The disease is caused by a profession (parquet floor specialist).

**Shin.** With an isolated fracture of the tibia in adults, the curvature of the axis is often insignificant. Direct injury can lead to an isolated transverse fracture of the tibia. In such cases, due to the intact tibia, the displacement of the fragments is small or non-existent. In this regard, there is no transmissible pain and clinically only local pain and hematoma can be determined (Fig. 103).

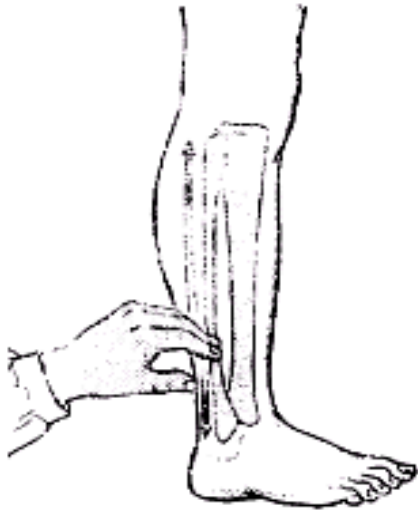


Fig. 103. **Isolated fracture of the tibia.**

**Achilles tendon disease.** Inflammation occurs after long marches in cold weather. Defined by pain and crepitation, which is determined after active dorsiflexion of the foot. Achilles tendon ruptures can occur spontaneously. In most cases, with a slight increase in load, the patient feels pain and feels a sudden weakening of the joint.

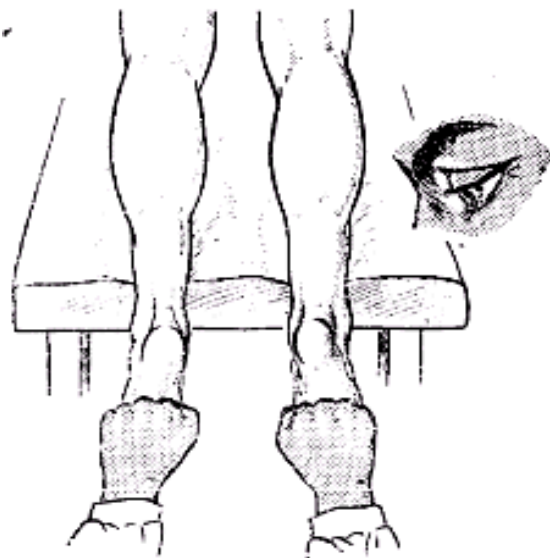


Fig. 104. **Rupture of the Achilles tendon on the right.**

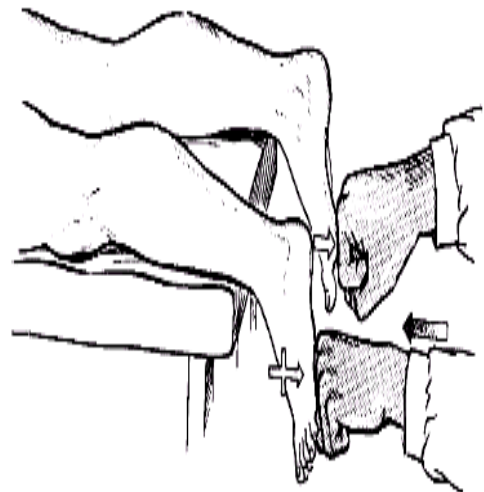
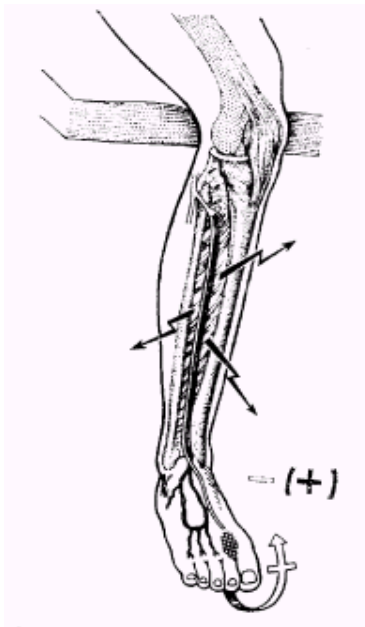


Fig. 105. **Rupture of the left Achilles tendon.** The doctor's fist is attached to the foot on the injured side, the patient cannot push

Examination is best to be carried out in the position of the patient on his/her stomach, with his/her feet which should protrude beyond the edge of the

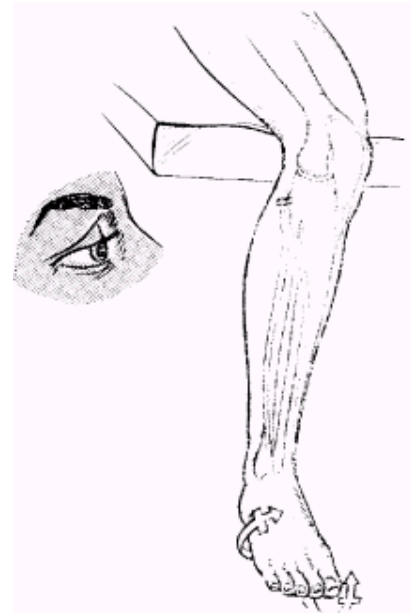
table (Fig. 104). There is a smoothness of the tendon outlines and swelling at the site of the rupture. The abdomen of the calf muscle is removed to the top compared to the healthy side. On palpation there is a failure at the site of rupture. However, if the patient has a strong long plantar muscle, the doctor, feeling the tendons of this muscle, will be misled about the rupture of the Achilles tendon, but in such cases the brute force will be reduced: it is checked by asking the patient to push the doctor's fists pressed to both of his/her feet (Fig. 105). Active plantar flexion is often impossible if you force your finger into the place of the rupture. **Thompson's test** is also negative (if the tendon is uninjured, the pressure on the sides of the calf muscle causes plantar flexion of the foot. The same as in the case of the rupture of the Achilles tendon, only the hematoma and failure are slightly higher.

**Anterior tibialis syndrome** occurs after prolonged stress on the shin during physical exertion or injury. This increases the pressure in the sheath of the tibia, closed by the fascia and bones. At first there is a pulling pain outside a crest of a big tibia, the dorsiflexion of a foot weakens and it is limited. Compression of the deep tibial nerve passing along the bed causes a loss of sensitivity in the area of the



<- Fig.106. Syndrome of the anterior tibialis muscle. Spontaneous pain in the muscular bed. Restrictive dorsiflexion of the foot.

Fig.107. -> Supination of the anterior part of the foot and lack of sensitivity in case of the loss of tibial nerve function.



foot measuring 2x3 cm, located slightly above the first interdigital space (Fig.106). The disease can lead to ischemic contracture of the suppressed muscles: difficult dorsiflexion of the foot with the first toe unbent, directed to the sole.



In contrast to paralysis of the tibia the nerve of the hanging foot will not be due to muscle contracture. The consequence of complete loss of function of the tibia is the position of supination of the anterior part of the foot and the lack of sensitivity on the outer surface of the tibia and the back of the foot (Fig. 107). At injury only of a superficial branch of a small tibial nerve sensitivity on an external surface of a shin and a back of a foot is broken, at the same time it will not be possible to lift actively an external edge of a foot. When the deep branch of the tibia is injured, the dorsiflexion of the entire foot becomes impossible, the sensitivity is lost only in the small area mentioned above (Fig. 106). At a hanging foot there is no supination caused by paralysis of a superficial branch of a nerve. Hanging foot leads to a slapping (cock) gait; characteristic of paralysis of the tibia (dislocation of the tibia, fracture of the head of the tibia, compression with a plaster cast, splint).

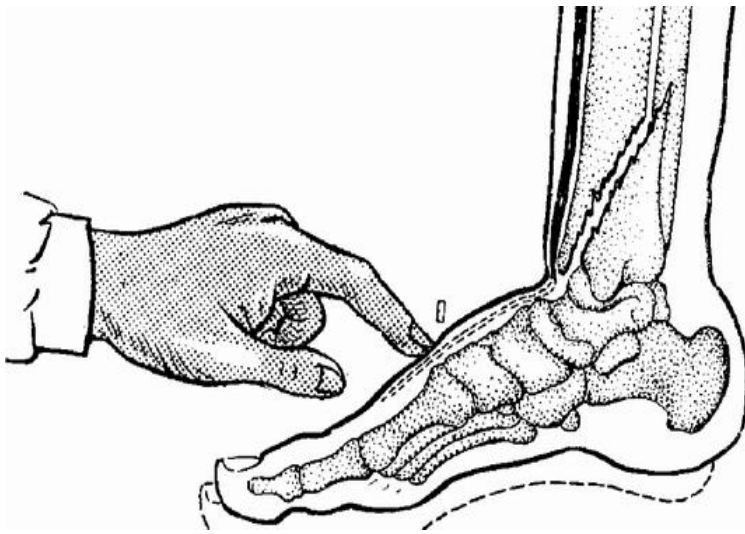
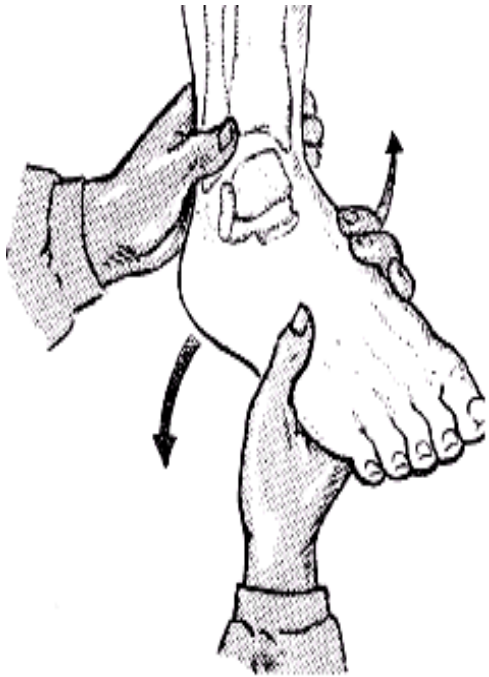


Fig. 108. **Fracture-dislocation.** Ischemia of the foot, lack of pulsation in the posterior artery of the foot.

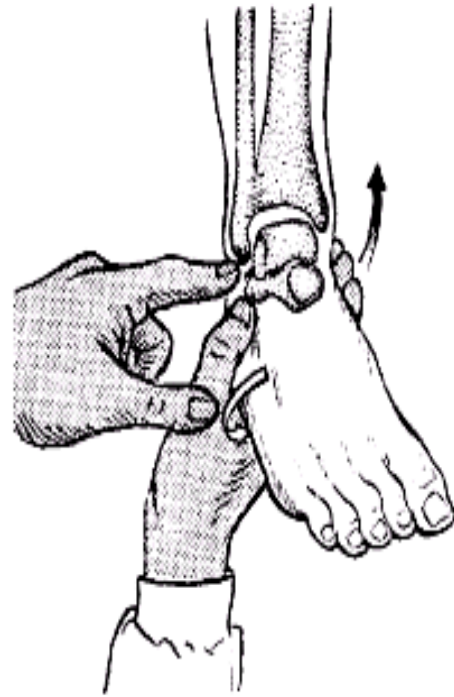
**Fracture of the ankle bone** often leads to a defective condition of the foot, and fracture-dislocation - sometimes to ischemia of the metatarsus (Fig. 108). Tension or rupture of ligaments is common in the ankle joint. Tension of the ligament means forced movement in the joint due to injury that exceeds the normal volume along the axis of rotation, or movement of the joint along the wrong axis of rotation. At the same time various damages of fabrics are possible: from simple

stretching of a capsule and the ligament with small tears to complete rupture of separate ligaments and parts of a joint capsule.

If there is a rupture of the ligament, the joint diverges in this area, and in some cases you can feel through the rupture of the intra-articular structure (for example, the edge of the heel bone when the rupture of the lateral ligament of the ankle joint (Fig. 109). Rupture of the external ligament of the ankle joint in the middle third – it is possible to often notice the failure in this place and even the underlying bones (heel, suprachal, (Fig. 110). To check syndesmosis with the first and second fingers of one hand tightly squeeze the area from behind, and the other - capture the metatarsal (Fig. 111) If you now penetrate the foot, then the rupture – bones diverge.



**Fig. 109. Opening of the joint in case of rupture of ligaments** (rupture of the external ligament of the ankle-foot joint).



**Fig. 110. Rupture of all bundles of the external ligament of the ankle joint in its middle third.** Opening of the joint - failure on the outside of more than 7 mm. The rotational movement in front of the mold reveals the lower part of the joint.

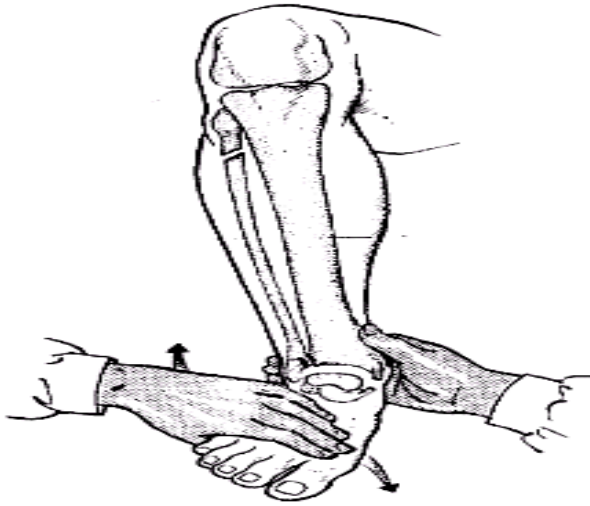


Fig. 111. **Maissonneuse fracture: high tibial fracture bones, rupture of syndesmosis, rupture of the inner lateral row.**

When the foot is pronated, the heel returns, which dilutes the bones in unstable syndesmosis.

**Foot.** During the examination of a standing patient, the position of the axis of the heel bone relative to the longitudinal axis of the tibia behind, the longitudinal curvature of the inner edge of the foot from the side, the ratio of anterior and posterior foot, and the transverse curvature of the forearm in front and floor are evaluated. Any deviation corresponds to a certain variant of foot deformity. They occur in combination more often than individually. Displacement of the heel axis with an increase in the horn to the medial side: valgus foot; to the lateral side: varus foot; reduction of the longitudinal arch of the inner edge of the foot: flat foot; raising the longitudinal arch of the inner edge of the foot: full foot.

Deviation of the longitudinal axis and metatarsal bone from the longitudinal axis of the heel:

- in the medial direction: the foot is reduced;
- in the lateral direction: the foot is taken away;

Expansion of the anterior part of the foot and strengthening of the support on the heads of the middle metatarsal bones: transverse foot.

Deformity of the foot can lead to pain. At a flat and hollow foot, the arch of a foot is broken, and at a flat-transverse foot, on the contrary, - metatarsal bones. With flat feet rapid fatigue and pain can sometimes be observed.

From a long load during the march, the metatarsal bones can spontaneously break (often with a flat transverse foot) - **march fracture**. Clinical symptoms:

transmissible pain, local pain and hematoma. Often these symptoms are more reliable than radiological data.

**Valgus thumb** is characterized by a vicious valgus position of the first finger more than 10 degrees. Mainly in the metatarsophalangeal joint and subluxation in it with a shift of the distal head of the metatarsal bone inward, which looks like an exostosis. In most cases over a "exostosis" the mucous cap which is felt (fig. 112) is formed. Prerequisite for this disease is a flat-transverse foot.



Fig.112. Valgus deformity of the thumb.



Fig. 113. Hammer finger.

The **hammer finger** is fixed in the flexion position in the interphalangeal or metatarsophalangeal joint. The joint is swollen and the articular head is located directly under the skin (Fig. 113).

### Examination of the nervous system

Rapid determination of neurological status includes assessment of: consciousness, state of mind (orientation in place, time and in relation to oneself, logical and consistent presentation of anamnesis), speech (pure, blurred), aphasia (impressive, expressive), activity of head, torso and limbs.

Memory can be good and reduced, with traumatic brain injury – ***retrograde amnesia*** (the patient does not remember the moment of injury and previous events).

Sleep can be refreshing, disturbing, insomnia. Insomnia and disturbed sleep occur with fever in the postoperative period. Dizziness is observed in case of the traumatic brain injury, bleeding and anemia, when after a long bed rest for the first time the patient sits down or gets to his/her feet.

***Headache*** occurs for many reasons (hypertension, fatigue, lack of sleep). To mitigate the headache, it is necessary to establish the cause.

To determine the tactile and painful sensitivity touching the skin with a blunt or sharp end of a needle is used. In patients who are unconscious, the corneal reflex is checked – when the cotton wool touches the cornea, the conjunctiva lashes close; and the conjunctival reflex – touching the conjunctiva with a cotton ball – the lashes close. ***Pupil reaction to light*** – the patient looks at the light. His/her palms close his/her eyes. If you take your hands away from his/her eyes, the pupils will be narrow.

In ***thyrotoxicosis***, traumatic brain injury, the convergence reflex is checked - the patient is asked to look at the fingertip of the doctor, who is slowly approaching the patient's nose. The eyeballs converge (convergence). At the same time the pupils narrow (accommodation). ***Achilles tendon reflex*** - the patient kneels on a chair, feet hang down. A hammer strikes the Achilles tendon. You can lay the patient on his/her stomach, lift both legs and hit the Achilles tendon with a hammer. There is a reduction of the flexors of the foot. The reflex is increased in thyrotoxicosis, reduced or absent in myxedema. With ***diffuse peritonitis***, bleeding into the abdominal cavity may be important abdominal reflexes: upper - holding a line with your fingertip or hammer handle on the skin below the costal arch; middle – horizontally at the level of the navel; lower – in the groin area. At the time of the risk, the abdominal muscles contract normally. At the specified intra-abdominal pathology these reflexes are either absent, or weakly expressed. ***Paresthesia*** is a feeling of numbness, crawling ants without external irritation.

**Causalgia** – burning pain below the site of the injury, phantom pain occurs in the stump after amputation. Pyramidal signs – abdominal reflexes and Babinsky's symptom: the handle of a hammer is carried out on the outer edge of the plantar side. There is a dorsiflexion of the big toe and a flabby discrepancy (II-III-IV-V toes). **Sign of meningeal irritation:** when bending the patient's head there is a sharp tension of the occipital muscles in meningitis, traumatic brain injury, epi- and subdural hematomas. Check the function of cranial nerves: vision - II pair, hearing - VIII pair, eye movement - III, IV and V pairs, face - VII pair, sometimes sense of smell - I pair, hoarseness - the rotating branch of the vagus nerve - X pair.

**Pain** is the most common symptom that leads a patient to the doctor. For a physician examining of a surgical patient, there is a significant difference between "somatic" pain coming from the surface of the body and "visceral" pain that occurs in the internal organs. Somatic pain, as a rule, pain can be cutting and burning and has a constant character. Its location can be accurately determined by the patient. **Visceral pain** is felt as dull and piercing. Periodic contractions, alternating with almost painless intervals, occur in the hollow organs and are called **colic**. Colic is caused by periodic contractions of smooth muscles that try to overcome an obstacle in the lumen of the porous organ. The pain is varied. The transition from visceral to somatic pain is always a disturbing symptom. This is an expression of the transition of the pathological process from one of the internal organs to the peritoneum (for example, acute appendicitis complicated by peritonitis). **Persistent pain** that can be accurately localized is of somatic origin, and diffuse - visceral.

Sudden abdominal pain, felt as a dagger blow, the beginning of which the patient notes to the nearest minute, indicates perforation of the cavity with peritoneal phenomena, and sudden pain without signs of peritoneal irritation - against perforation; sudden severe pain in the limb indicates embolism, and sudden pain in the chest with shortness of breath - spontaneous pneumothorax.

In most cases, the pain develops slowly and continuously over several hours or days. Pain can occur regularly or disappear during the day. This flow of time is called a "clock schedule" (a typical example is a duodenal ulcer). Pain is

associated with an exacerbation of the disease that occurs at the same time of year and is called "seasonal" and is also characteristic of duodenal ulcers.

The pain may also depend on the position of the body (Fig. 114). In a

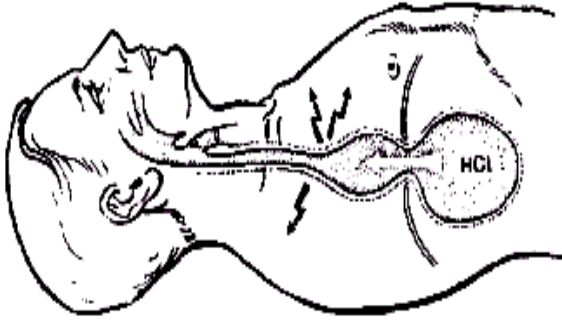


Fig. 114. **Pain depending on the position:** in the supine position with hernia of the esophageal orifice of the diaphragm there is pain due to reflux of acidic gastric contents.

certain position of the body, the patient has pain that disappears again after changing the position, for example, pain due to reflux of acidic gastric contents in the supine position with hernia of the esophageal orifice of the diaphragm, radicular pain in spinal disease). In the lowered hand at a panaritium the pulsating pain, night at osteomyelitis is felt.

Pain associated with the movement is often accompanied by the *joint disease* (Fig.115). The appearance of pain with certain movements can help establish the diagnosis. *Morning pains* (when getting out of bed), for example, are

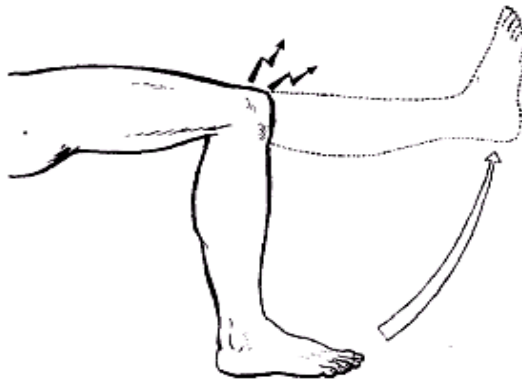


Fig. 115. **Pain associated with movement.**

characteristic of arthrosis, and with arthritis the slightest movement is painful.

On the contrary, when the menisci are damaged, only well-defined movements cause pain. The colic may end from the movements and the peritoneal pain may increase.

*Shortness of breath* is a subjective feeling of increased respiratory function. It is also common to call shortness of breath any objectively established excessive hyperpnea or tachypnea, not accompanied by shortness of breath or subjective feeling of increased breathing. Shortness of breath is usually based on oxygen starvation. It can be caused by pulmonary (pneumothorax), cardiac causes or decreased respiratory function of the

blood (bleeding). Shortness of breath can also occur in case of acidosis, dysfunction of the respiratory center, diseases of the respiratory center, diseases or injuries of the brain or under the influence of mental factors (hyperventilation).

**Tumors.** The tumor tissue itself usually does not cause pain. Pain caused by a tumor most often depends on the stretching of neighboring tissues by rapid tumor growth, tumor infiltration of nerve tissue or organ dysfunction. For example, tumor obstruction of the intestinal lumen leads to colic-like pain, at the same time, constant pain in tumors of the gastrointestinal tract already indicate its transition to the serous membrane or infiltrative growth. The specific nature of the pain is sometimes almost pathognomonic for some types of tumors. Their cause is either the location or type of tumor. Thus, tenesmus indicates cancer of the rectum, and nocturnal bone pain - a primary bone tumor or metastasis (most often).

Any tumor, with rapid growth, is suspected to be malignant until proven otherwise. However, rapid growth is not pathognomonic for malignant tumors, cysts (ovary, breast, goiter), hemorrhage into benign formations (goiter) can grow and increase very quickly. It is known that from the first pathological division of the cell, which provides the basis of a malignant tumor, to the clinical manifestation often pass years and that the tumor may appear suddenly after a long period due to its rapid growth. Data on the length, width and depth of the tumor should be measured in millimeters or centimeters. The size of the tumor never allows to establish its prognosis. It is worth remembering Virchow's law, according to which small malignant tumors metastasize faster than large ones. A round tumor with well-defined edges is more likely to be benign, while a tumor of indeterminate shape without clear boundaries is more likely to indicate infiltrative growth. The surface of the tumor can sometimes indicate its nature. Thus, a rapidly growing cystic tumor differs from a malignant tumor by its smooth surface. It is also important to change the skin over the tumor. If the pigment spot changes its color and its surface begins to bleed, you should be afraid of its transformation into melanoma.



The soft consistency more often testifies in favour of a benign change and occurs in lipomas, papillomas and polyps. But a soft consistency can have an undifferentiated, rapidly growing and disintegrating malignant tumor (sarcoma, anaplastic carcinoma). The hard consistency is formed due to the growth of connective tissue and is characteristic of fibroids, keloids. The woody consistency is characteristic of a cancerous tumor. Together with the lack of clear boundaries, bumpy surface and often painless palpation indicates in favor of a malignant tumor. Tumor of iron density is extremely suspicious of malignant, but the same consistency is characteristic of chronic inflammation with severe fibrosis (Riedel's goiter).

If the tumor does not shift relative to neighboring tissues, then this is based on two possibilities: a) the tumor comes from those tissues in relation to which it is immobile; b) the tumor infiltrates neighboring tissues. If it is a real tumor infiltration, not inflammatory, then most likely the tumor is malignant. At a tumor on a body surface it is necessary to pay attention to its mobility concerning skin and muscles.

## CHEST

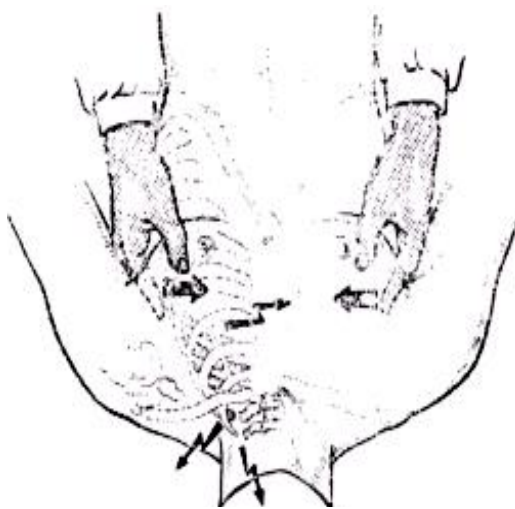


Fig.116. Lateral transmission pain in case of fractures of the ribs in the anterior and posterior

Examination of the heart and lungs is the main section of therapeutic diagnosis. Among the congenital malformations, the most typical one is a *funnel-shaped chest*. The sternal and costal cartilages fail in such a way that the greatest deepening falls on the xiphoid process. Complaints of fatigue, palpitations or shortness of breath are present.

The funnel-shaped chest treatment differs at a different age. With rickets chest, the upper sternum protrudes forward and the clavicle goes backward. At external wounds there is always a question of

integrity of a parietal pleura. A patient with pneumothorax needs emergency care. If there is no lung damage, the chest wall wound does not pose an immediate danger except for bleeding from the intercostal artery..

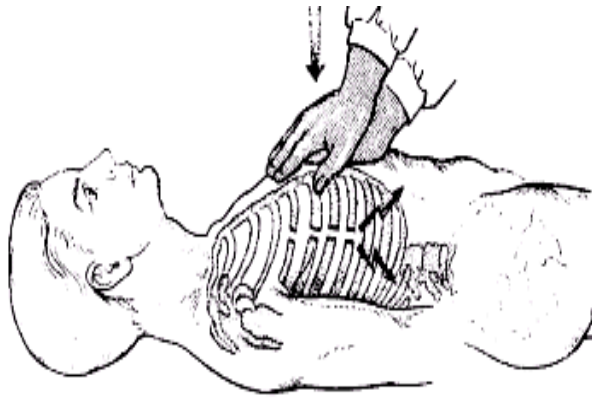


Fig.117. **Transmission pain in lateral rib fracture.**

Rib fracture can be suspected on the basis of direct injury and pain, which coincides with breathing and coughing. Compression of the thorax on the sides causes transmission pain if the ribs are broken in their anterior or posterior parts (Fig.116), and pressure on the sternum in the supine

position causes transmission pain in lateral fractures (Fig. 117). A sign of rib damage is *a sign of Besne*: the doctor, who is behind the patient's back, places his/her fingertips on the ribs of the axilla; a decrease in the volume of respiratory movements on the corresponding side indicates damage to the ribs and its degree. When one rib is broken, most often there is only local pain. The diagnosis of rib fracture is established clinically, and radiologically may not be detected. Rib fractures can be complicated by injury to the lungs or intercostal artery. At the same time there is a hemo- and / or pneumothorax. These complications are more common in multiple rib fractures. Of particular concern are multiple rib fractures, where each rib breaks both anteriorly and posteriorly, which does not provide the mechanical stability required for respiration. At the same time the fragment of a chest wall sinks at breath, and at an exhalation swells (*a sign of a squishy shutter*). With these unnatural respiratory movements, the patient tries to counteract the inclusion during inhalation of additional muscles: stair, large pectoral, toothed lateral, long back muscles and sternoclavicular-nipple, and during exhalation by a special mouth formation to increase resistance in the dead space (Fig. 118).

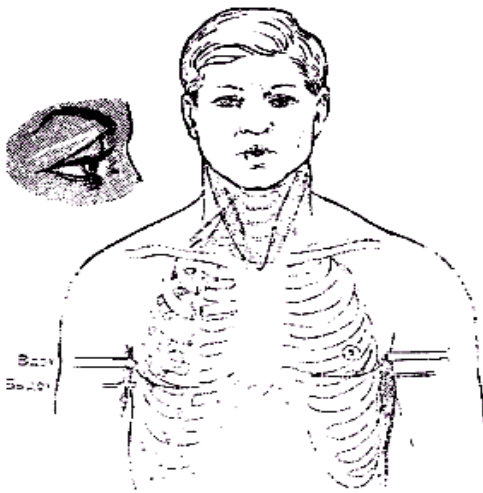


Fig. 118. **Paradoxical breathing with multiple double fractures of the right ribs and unstable chest.**

The sternum is broken transversely, there may be a double fracture with a shift of the fractures inward. On a noticeable local hematoma and a ledge palpated with local pain, the diagnosis is more reliable than with radiography.

The pleural cavity provides the necessary negative pressure to straighten the lungs. When the parietal pleura is injured, air is sucked into the pleural cavity, accompanied by audible noise (Fig. 119).

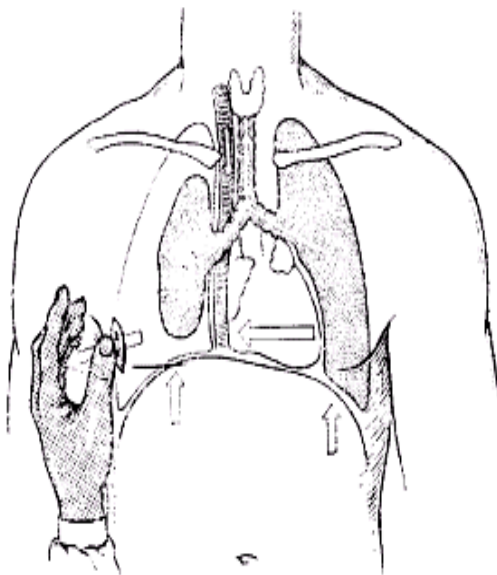


Fig.119. **Open pneumothorax.** When you exhale, the interstitium moves to the old place: flotation of the interstitium.

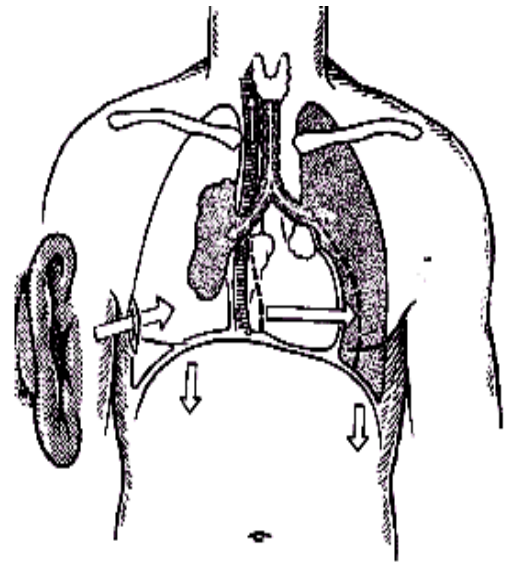


Fig.120. **Open pneumothorax.** When inhaled, the interstitium shifts to the healthy side and impedes venous rotation.

When you exhale, this air is pushed out through the wound due to a decrease in the volume of the chest cavity, which can be detected by the hand raised to the wound (Fig. 120) - this is an open pneumothorax. Atmospheric pressure in the injured half of the chest creates a relative excess of pressure during inspiration compared to the healthy side. This leads to a shift of the cardiovascular bundle in a healthy direction.

After removing air during exhalation, the cardiovascular bundle occupies the initial position. There is a flotation of the interstitium. Obstruction of venous outflow can lead to cardiac arrest. In addition, the oxygen saturation of the blood is reduced, because when inhaled air from the injured side is sucked into the lungs on the healthy side, and when exhaled again

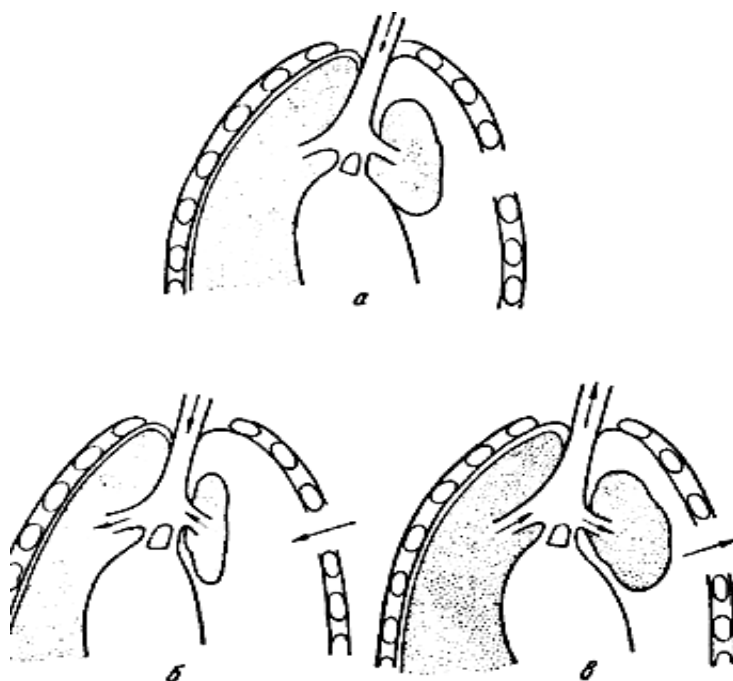


Fig. 121. The scheme of paradoxical breathing at an open pneumothorax:

a - respiratory pause; b - breath;

moves to the straightened lung on the injured side: pendulum-like movements of air - paradoxical breathing (Fig. 121). Clinically, shortness of breath and cyanosis come to the fore. With penetrating chest injuries, the lungs are often injured along with the pleura. The air coming from the lungs has an adverse effect on a hermetically sealed external wound, if it can not stand out. With each breath, the air coming from the lungs leads to an increase in intrapleural pressure on the patient's side - intense pneumothorax. At the same time the interstitium is pressed in the healthy party that complicates venous outflow. The reason for this mechanism is a small injury to the lung, which acts as a valve that allows air only towards the pleural cavity. Percussion - a resounding sound that weakens breathing (Fig. 122).

*Spontaneous pneumothorax* is more common in young men and is caused by rupture of blisters with bullous emphysema in the apex of the lungs. Shortness of breath, cyanosis and venous stasis.

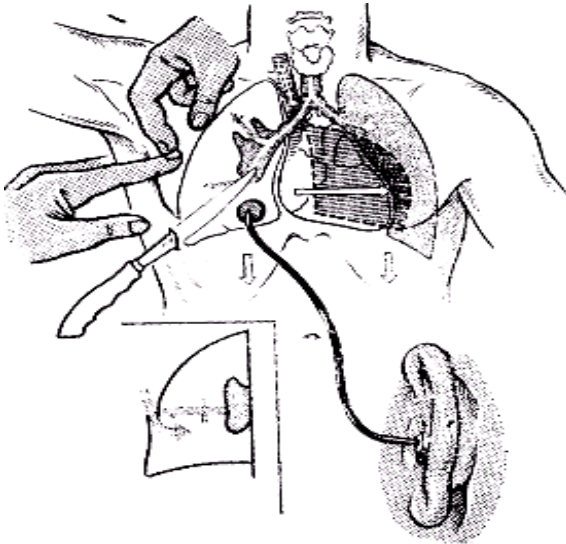


Fig.122. **Intense pneumothorax due to sudden rupture of the emphysematous bladder or valve mechanism with penetrating injury.**

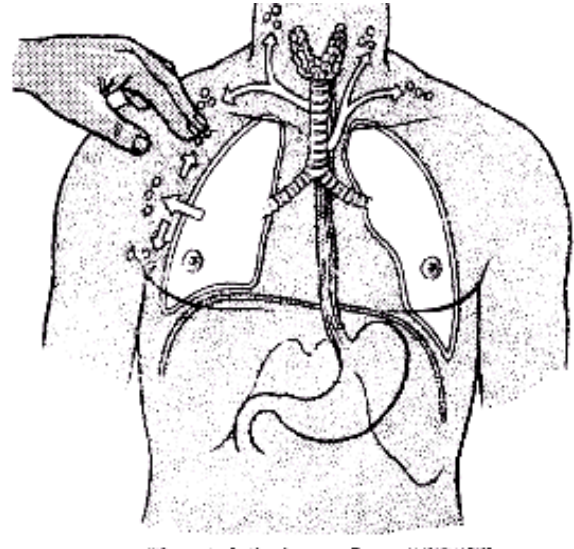


Fig.123. **Subcutaneous emphysema with closed wound of the lungs or pleural cavity without a valve mechanism, with perforation of the trachea or esophagus.**

Percussion ringing sound, at auscultation the breath is weakened or it is absent over all half of a thorax. Decreased blood flow leads firstly to tachycardia and then to a drop in blood pressure. If there was no injury to the pleural cavity or it was covered by the valve mechanism, air through the injured pleural cavity may move under the skin, where air bubbles are palpated ("crunch of snow"); there is a subcutaneous emphysema (fig. 123).

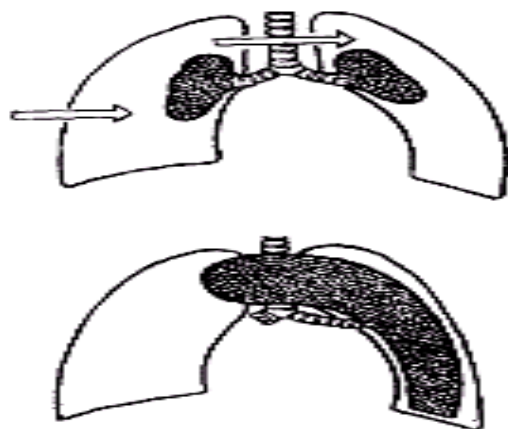


Fig.124. **Interstitial hernia formation**

Injury to the pleural cavity and interstitium can lead to bilateral pneumothorax. When the mediastinal pleura is damaged without pneumothorax of the lungs, it can go to the opposite side: an interstitial hernia is formed (Fig. 124).

It occurs after pneumonectomy. In such cases, a healthy lung bulges the pleura and interstitium in the patient's direction, during auscultation on the side

of pneumonectomy, in the upper field is determined that the lungs are ventilated: audible breathing. Exudation in the pleural cavity is recognized on the basis of percussion and auscultation. The nature of the effusion is set determined by the puncture of the pleura. Serous pleural effusion occurs in heart failure, uremia, pneumonia, tuberculosis, embolism, after surgery on the thoracic cavity or secondarily after intra-abdominal surgery.

**Hemothorax** has a post-traumatic or postoperative origin and is often combined with pneumothorax (hemopneumothorax). Empyema of nonspecific origin occurs in secondary infected pneumothorax or hemothorax, or after the breakthrough of an abscess of the lungs, liver; chylothorax is rare, its etiology remains unclear. A brown turbid (several liters per day) liquid without flakes in sterile punctate is typical.

**Lungs.** Lung development defects include cystic lung, lung cyst, bronchogenic cyst, hemarthroma.

Recurrent pneumonia is most often caused by: bronchiectasis, lung abscess, focal chronic pneumonia, malignant tumor, Zenker's diverticulum.

The essence of bronchiectasis is to expand the lumen of mainly segmental and subsegmental bronchi, dysfunction, draining them and inflammatory changes in the bronchial wall and surrounding lung tissue. Patients have a constant cough, intensified by exacerbation of inflammation in the wet, cold months, in the form of attacks in the morning with the release of stagnant pus at night, three-layer, sometimes up to 1 liter per day of sputum. A history of frequent colds – since early childhood ("bronchiectasis is the end of a song sung, if not in the cradle, then in childhood"). The chest is emphysematous, bronchial breathing and increased vocal tremor, audible hoarseness of various calibers can be heard. The diagnosis is confirmed by bronchography. Intermittent fever and purulent, foul-smelling sputum determined the lung abscess. Lung radiography helps a lot with diagnosis.

With low immunity, nonspecific pneumonia can take a long time and turn into chronic pneumonia. The exact diagnosis is established only at histologic research after the made resection of a lung. In each case of recurrence of

pneumonia, especially in smokers, it is worth considering bronchial cancer. From the anamnesis it is possible to establish such general symptoms as weight loss, decrease in working capacity, loss of appetite, etc. Almost 80% of patients complain of cough, more than 60% - with sputum, 40% complain of shortness of breath and as much pain, 32% have hemoptysis. In most cases, it is not possible to identify the tumor itself by tapping and listening, even when it reaches a significant size. On the contrary, complications such as perifocal pneumonia, bronchoectasis, atelectasis, pleural effusion in peripheral cancer, high standing of the diaphragm in infiltration of the phrenic nerve and hoarseness of the voice when involving the recurrent nerve, etc. can often be found. The diagnosis is specified radiologically (a picture of a thorax in anteroposterior and lateral projections, tomography); endoscopically (bronchoscopy with biopsy and cytological examination); laboratory (cytological examination of sputum). In the presence of limited formations in the lungs, it is difficult to make a differential diagnosis between cancer and abscess. To do this, repeated zonal rheography of the lungs is used, the dynamics of which in the first case is negative, in the second positive or unchanged.

*Cancer of the apex of the lung (Pancost's tumor)* causes venous stasis in the affected arm, and sometimes *Horner's sign*. In lung tumors, palpation is aimed primarily at finding metastases in the supraorbital lymph nodes and the liver. Pancreatic tumor often has a syndrome of the humeral plexus.

The most important benign lung tumors: bronchial adenoma, hamartoma, bronchial endometriosis, parasitic tumors (bronchial and alveolar echinococcosis). Benign endobronchial tumors are found in most cases indirectly through hemoptysis, recurrent pneumonia, bronchiectasis or atelectasis. With bronchial endometriosis, hemoptysis occurs during menstruation. Sometimes benign lung tumors are found by accident during X-ray examination.

Differential diagnosis of chronic nonspecific inflammation and some forms of pulmonary tuberculosis, as well as tumors is impossible on the basis of physical examination alone.

Surgical forms of pulmonary tuberculosis: residual cavities; tuberculoma; bronchial stenosis; polycavernosis (lattice lung); pleural connections. X-ray, endoscopic, laboratory (bacteriological analysis and sputum culture), puncture biopsy are used for diagnosis.

Pulmonary atelectasis in surgical patients is of great importance, especially in the postoperative period. Insufficient excursion of a thorax is caused by pain, leads to obstruction of bronchial tubes by a secret. For this reason, individual segments, the entire lobe, or even the entire lung may be atelectasis. Atelectasis impairs respiration and blood circulation. At a big atelectasis find dulling, weakening of a vocal tremor and bronchial breath without rales. At auscultation breath is weakened to complete absence. Tachycardia often develops at normal blood pressure and temperature. In contrast to pleurisy, the interstitium is displaced to the patient's side, which can sometimes be judged by the movement of the apical heartbeat in not very obese patients who do not have myocardial hypertrophy (Fig. 125). At an atelectasis, intercostal spaces are involved, at a pleurisy explode.

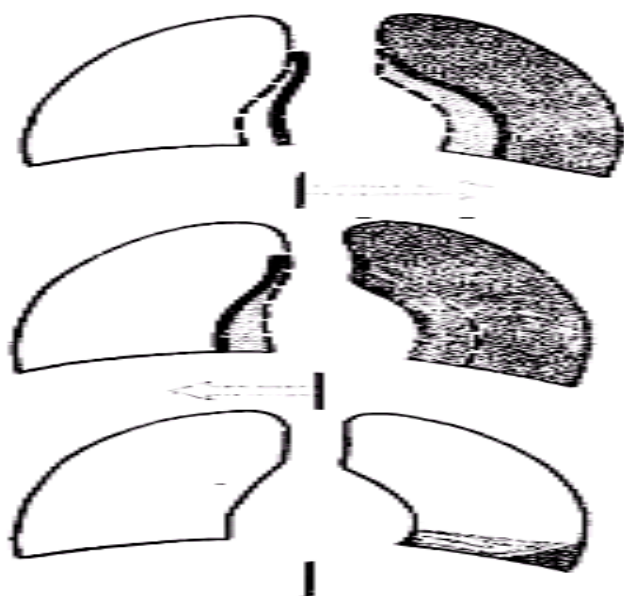


Fig.125. Above: atelectasis of the interstitium is displaced in the patient's direction. In the middle: the pleura and interstitium are shifted to the healthy side. Below: pulmonary embolism and pulmonary infarction - the interstitium is not displaced.

***Pulmonary artery embolism*** and pulmonary infarction more often develop in the postoperative period. Pleural pain, which occurs suddenly and is exacerbated by exhalation, is different from less intense pain, which develops slowly in pneumonia or pleurisy. Characteristic shortness of breath, pale bluish skin and fear



of death. Tachycardia, associated in some cases with a drop in blood pressure, makes it difficult to differentiate with myocardial infarction. Sometimes you can hear an accentuated and late tone on the pulmonary artery or observe stagnation in the jugular veins. The cause is thrombosis of the deep veins of the leg, thigh or pelvis, which develops in the postoperative period. Establishment of an embolism by means of physical inspection is possible only in some hours from the beginning of a disease: typical noise of friction of a pleura, pain in the field of heart. The diagnosis is confirmed by the appearance of bloody sputum, about two days later. Pulmonary infarction due to pulmonary embolism is accompanied by pleural effusion. If a pulmonary infarction is infected, it is clinically difficult to distinguish it from bronchopneumonia. At a massive embolism with an acute blockage of both branches of a trunk of a pulmonary artery there is a feeling of fear of death, pain is most often absent, hemodynamics that leads to death is quickly broken. To determine operability, it is often required to provide a separate determination of lung function, which uses a complex and traumatic method of separate bronchspirometry. With this purpose, we have proposed and effectively application in the clinical practice of the method of zonal lung rheography.

### **Cardiovascular system**

The doctor first pays attention to the symptoms of decompensation. The most important of them are:

- stagnation or pulmonary edema;
- stagnation in the jugular veins and / or hepato-jugular reflex;
- stagnation in the liver;
- peripheral edema (legs, buttocks).

Severe decompensation is a contraindication to surgery and requires adequate conservative treatment first.

**Heart.** Congenital “blue” heart defects are recognized early in most cases and, as a rule, patients are operated on quite soon. Congenital heart disease without cyanosis can remain unrecognized for a long time until the patient consults a

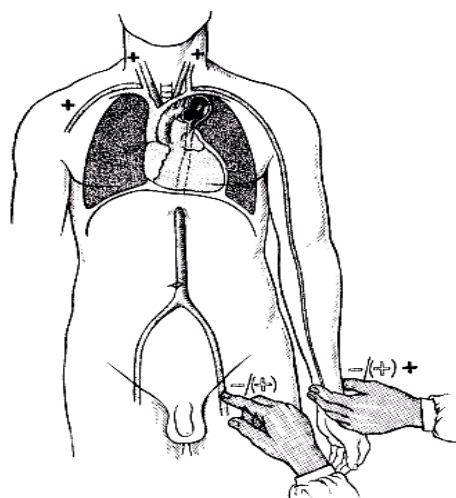
doctor about another disease. The same applies to valves acquired defects. Since these defects are most often characterized by auscultatory data, they can be recognized clinically. Operability depends on the presence or absence of heart failure, however, aortic coarctation or aortic valve defect may require immediate surgery for heart failure that cannot be treated conservatively. Signs of aortic valve insufficiency: double murmur over large peripheral arteries (*Duroziez-Vinogradov sign*) and short presystolic murmur at the apex of the heart (*Flint's sign*), narrowing of the pupil during systole and its dilation during diastole (*Landolph's sign*). The greatest danger is posed by aortic valve stenosis, which can suddenly decompensate even without heart failure. At initially pale congenital defect the stenosis can be caused by transformation of the left-right shunt in the right-left and serve as expression of the increased pressure in a right ventricle as a consequence of the increased vascular pulmonary resistance. It is a contraindication for surgery. Eisenmenger described the sign of "inverted" from right to left, bleeding due to high pulmonary hypertension: secondary cyanosis, which occurs in primary pale congenital heart defects with arteriovenous shunts at any level (often the battle duct).

*Aortic coarctation* may remain asymptomatic for many years. It is accompanied by a weakened and delayed pulse in the lower half of the body on both sides, in very rare cases, a decrease in the growth of the lower extremities. In the second and third intercostal spaces on the left, a loud systolic murmur is heard with a maximum on the back between the shoulder blades.

Suspicion of a heart injury arises at the penetrating wound in its projection and in a state of shock. Blood pressure drops, darkening of consciousness increases, heart rate increases, shortness of breath, cyanosis, dull heart sounds. An important cognitive feature is venous stasis in the upper half of the body. Blunt heart injuries include palpitations, concussions. Heart attack is characterized by chest pain and an existing arrhythmia at auscultation, cardiogenic shock, acute heart enlargement or rapidly developing heart failure. When examining a surgical patient, always remember about prolonged septic endocarditis or subacute bacterial

endocarditis. These diseases often remain unrecognized and patients come to the surgical clinic for surgical treatment of a completely different inflammatory disease (eg., cholecystitis). The main diagnosis is a heart defect with appropriate auscultatory data. On the skin you can distinguish typical spots of color "coffee with milk". In later cases, significant splenomegaly appears. There are symptoms of latent infection: low-grade fever, fatigue, accelerated ESR.

Small injuries of the trachea lead to the entry of air into the interstitium and hemoptysis, and large – in addition to difficulty breathing (inhalation and exhalation stridor). Air entering the skin causes subcutaneous emphysema, which can spread throughout the body. The main danger of any injury to the trachea is shortness of breath and mediastinitis. Vascular wound hematomas often form the basis for the development of delusional aneurysms. There may be a venous aneurysm. This increases the load on the heart and increases the pressure in the pulmonary artery. The appearance of continuous vascular noise is characteristic. The consequence of a blunt



**Fig.126. Traumatic aneurysm of the descending thoracic aorta.**

trauma may be a rupture of the inner layer of the aorta. The outer layers can resist blood pressure at the cost of their own stretching. In such cases, the torn part of the inner shell floats freely in space. Together with the squeezing hematoma, they impede blood circulation or block it completely. As a result, the peripheral pulse in the lower half of the body weakens or disappears. Due to the compression of the left iliac artery, the pulse may weaken or the blood pressure on the left arm may decrease (Fig. 126). Pain in the sternum with irradiation in the back (between the shoulder blades and near the spine on the left), and later in the neck or left arm should cause suspicion of rupture of the aorta with a corresponding injury. Venous stasis in the upper half of the body is the main symptom of chronic sclerosing mediastinitis.

**Detachment of the thoracic aortic aneurysm.** If the disease of the aortic wall (atherosclerosis, necrosis of the middle membrane) or after a blunt trauma of the sternum ruptures the intima, the blood penetrates between the layers and it leads to stratification. It can occur slowly and imperceptibly or occur suddenly. Complete rupture of the original aorta leads to cardiac tamponade; rupture of the arch of the aorta, abdomen or lower extremities only with a very long stratification. Characteristic difference is in the heart rate and the same weakening or disappearance of the legs. The aneurysm most often compresses the esophagus, sometimes the trachea, veins.

### Diseases of peripheral vessels

**Arteries.** In any disease of the arteries, the anamnesis plays an important role. At traumatic injuries the nature of an injury (penetrating wound, a blunt trauma) matters. Acute vascular occlusion without injury is based in most cases on heart disease (parietal thrombus after myocardial infarction, valve defect or atrial

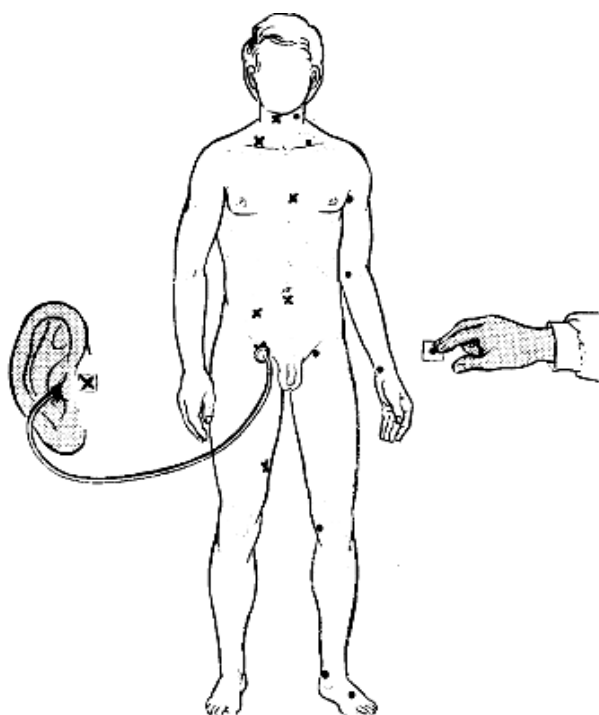


Fig.127. **Examination of arteries.** On the left - the main places for palpation (indicated by dots). On the right and in the middle - the main places for auscultation (marked with crosses).

fibrillation). Sudden onset of pain indicates acute ischemic syndrome (thromboembolism). Pale extremities indicate a sharp violation of arterial circulation, and bluish staining – a lack of oxygen saturation of arterial blood or venous stasis. The arteries are palpated at the points indicated in Fig. 127. The change in skin temperature can be determined by applying the back of the hand to the patient's skin, or using a special skin thermometer (Fig. 128). Auscultation of arteries is carried out in the points specified in Fig.127. In a

state of rest in norm there is a weak systolic noise over the main arteries. Symptoms of acute ischemic syndrome can be identified by five signs: pain in the beginning, paleness, paralysis, lack of peripheral pulse, loss of sensitivity.

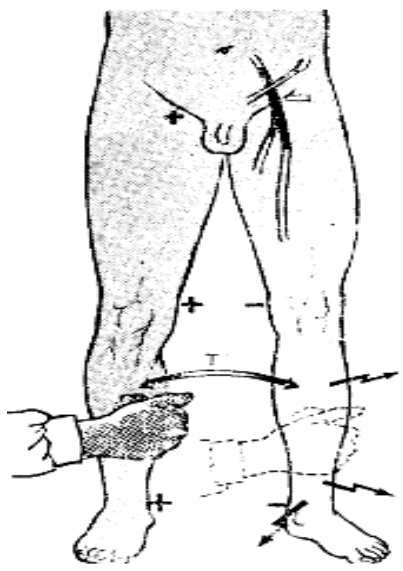


Fig.128. **Acute ischemic syndrome.**  
Comparative examination and palpation.

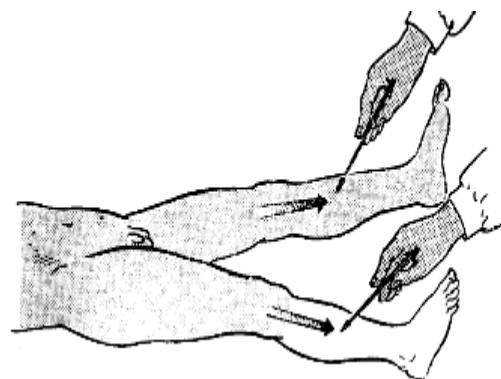


Fig.129. **Acute ischemic syndrome.**  
Sensitivity check.

*Acute ischemic syndrome* is accompanied by severe pain in the affected limb. At the same time the patient notes a cold and numbness in the extremities. The limb is pale its movements are limited. The pulse disappears in the painful area and just above it. A weakened pulse in the femoral artery is often felt with a blockage below the inguinal ligament. Sensitivity first decreases and then disappears. The difference between normal and impaired sensitivity may indicate the location of the artery blockage (Fig. 129). The veins become empty. In most cases, emboli are localized on the leg in the groin area (Fig. 128), on the arm - in the axilla.

*Chronic ischemic syndrome.* It is often caused by two diseases with different etiology, pathogenesis, prognosis, which affect people of different ages and are often misidentified. The most characteristic subjective signs of circulatory failure in the lower extremities is intermittent claudication (*Sharko's sign*). Pain in

the lower extremities appears after overcoming a certain distance, and after stopping the pain disappears. Ischemic pain in the feet, toes, ankles, calf muscles, and much less often in the upper legs, first appeared during walking, physical activity. Later, the pain became constant and served as a harbinger of further disorders. At night, to reduce pain, the patient's leg often goes down. At occlusion in the field of difficulty of blood circulation which was, collaterals owing to the prolonged thrombus can be blocked also. In such cases, the limb is often bluish or marble, rather than pale. The veins often remain filled. The clinical picture can be divided into stages: stage 1 is characterized by narrowing of the vessel in accidental angiography. Subjective complaints appear in 2 stages: they arise only at loading. The pain first appears when climbing a mountain or when walking for a long time on the level ground. The prognosis of the disease can be determined by the distance traveled and its reduction. Stage 2 is divided into 2a, when the patient can walk more than 100 m, and 2b, when this distance is less than 100 m. In stage 3, the pain occurs at rest, and in stage 4 marks gangrene (*Jurg Hegglin classification*).

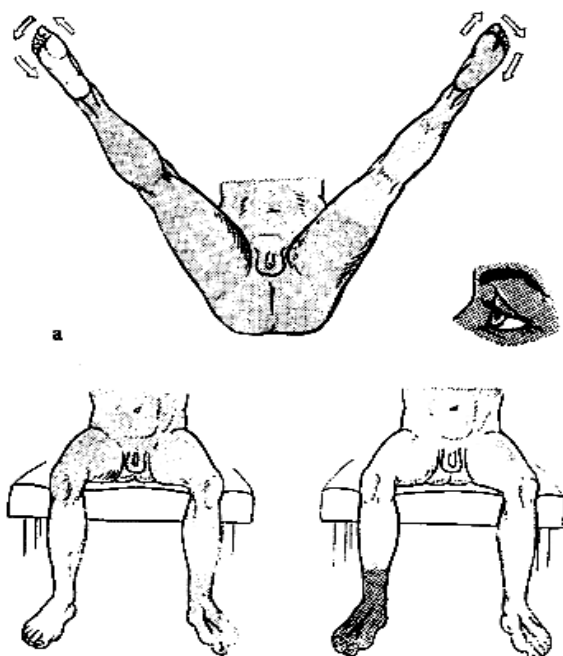


Fig.130. **Chronic ischemic syndrome:** a test with a Ratshov position. A - circular rotations of the feet with raised legs up to 45 degrees in the supine position. The sole of the foot on the affected side becomes pale earlier; b - with lowered legs, a healthy foot takes a normal color after 5 seconds. Filling of veins passes in 12 sec. The diseased foot remains pale, there is no filling of the veins; c - the sick foot is painted more strongly than healthy. If the staining and filling of the veins takes longer than 30 seconds, then there is a severe ischemic syndrome.

Chronic ischemic syndrome can be objectified by a test in the Ratshov position. If you ask the patient to raise both legs at an angle of 45 degrees and make rotational movements with both feet at the same time, then there is worse

blood circulation, foot become pale earlier. If the patient now sits down, the normal foot will take the old color in about 5 seconds and the veins will fill in 12 seconds, and the diseased foot will remain pale and its veins will not fill.

If the patient's foot hyperemia appears only after 30 seconds, it is a severe violation of arterial circulation (Fig. 130). At a chronic ischemic syndrome pulse of arteries is weakened or not determined.

**Panchenko's sign:** the patient in a sitting position puts the affected leg on a healthy one so that the popliteal fossa was on the knee of a healthy leg; after 3-5 minutes there will be pallor of the foot of the diseased foot, a feeling of numbness "creeping ants" in the foot and toes and pain in the calf muscle. **Berger's sign:** the patient lying on his/her back keeps his/her legs raised to the point of slight fatigue; the sole of the affected limb takes on a dead-pale color, and 2-3 minutes after lowering down the foot of the affected limb takes a cyanotic color. **Goldflam's sign:** pain and weakness in the affected limb during active movements. **Hertzel's sign:** a sign of atherosclerosis: if you put tourniquets on both legs and one arm, the blood pressure on the other arm in a healthy person rises by 5 mm Hg; with atherosclerosis of blood vessels, the pressure rises by 50 mm Hg and more. **Marburg's sign:** cyanotic spots on the pale plantar surface of the skin of the foot. **Moshkovich's sign:** after removal of an elastic bandage intensity and speed of emergence of reactive hyperemia on a sick leg are less expressed. **Eller's sign:** pale and cold feet. **Raynaud's sign** - angiopathy: paroxysmal cyanosis or pallor of the fingers (rarely the nose or ears) under the influence of cold or agitation. **Tuffier's sign** (a sign of the presence of collaterals): when squeezing the veins of the extremities simultaneously with the compression of the superficial arteries, swelling of the veins is observed only if there is collateral circulation.

Many different signs and tests are used in the diagnosis of obliterative endarteritis and atherosclerosis. Most of them indicate local tissue ischemia. However, these symptoms are subjective and without additional methods of examination do not make possible to detect the early stages of the disease.

It is known that in the early stages of obliterating diseases of the arteries of the lower extremities, a variety of sensations in patients, and hence hemodynamic disorders, occur only during exercise. Therefore, the use of various diagnostic methods at rest is often ineffective.

V.H. Kharchenko (1973) proposed two new *functional rheographic tests*.

1. Test with a physical activity – 20 movements in the ankle joint. Reovasogram recording is performed before and after exercise. The sample is considered positive when lengthening the anacrotic phase of the rheographic curve. Sometimes the latter has the appearance of a straight line for some time.

2. Test with finger compression of the femoral arteries under the pupar ligament for 30-40 seconds and determining on the rheovasogram the duration of the next vascular spasm. The test is considered positive at duration of a vascular spasm from 2 sec. and more.

The electrodes are placed on the dorsal surface of the foot and the outer surface of the lower leg in its upper third. Rheogram analysis is performed according to the shape of the curve, the duration of the anacrotic phase and the height of the amplitude of the main wave.

#### Some data of differential diagnosis

<b>Obliterative endarteritis</b>	<b>Obliterative atherosclerosis</b>
20-30 years old	over 45 years old
Juvenile type	Elderly type
Normal hair pigmentation	Typically blue
There are no senile wrinkles	Wrinkles are present
Temporal and radial vessels are soft	Compacted and solid
Often the upper extremities are involved in the process	Rare
A sign of coronary sclerosis is rare	Often

**Raynaud's disease** – attacks of pallor of the fingers, pain in the fingers and hands. Constant cyanosis of the fingers on the hands is accompanied by constant pain. Attacks of pallor of the fingers most often occur under the influence of cold,



emotions, physical activity or for unknown reasons. In the beginning attacks more often arose in 2-3 fingers and in the first 2-3 toes. A sign of circulatory disorders of the upper extremity is a *sign of Ratshov*: the patient standing raises his head slightly bent at the elbows and evenly compresses and spreads the fingers for half a minute: normally pallor does not occur, with pathology there is pallor of the palms and fingers.

**Veins.** In most cases, varicose veins of the lower extremities develop on both sides and is noticeable in the standing position of the patient. There are the following forms – nodular, main, which is expressed in a significant expansion of the trunk of the great saphenous vein, and placer. They subsequently lead to a varicose symptom complex characterized by skin pigmentation, edema and induration (Fig. 130), located on the inner surface of the tibia, approximately 8-10 cm above the inner pad (2-3 cm behind the great saphenous vein in the projection of the Coquet line). At insufficiency of communicating veins night spasms in calf muscles and hypostases in the evening disturb. Sometimes complaints are related to complications – inflammation, ulcers or eczema. The degree of valvular insufficiency, insufficiency of communicating veins and passability of deep veins is established: at Troyanov-Trendelenburg's test in a position of the patient lying down raise a leg and wait for decline of veins. After that on a hip a tourniquet is applied (Fig. 131, a). The patient is asked to rise. If the veins slowly fill down from the tourniquet, the communicating veins are capable. If there is a rapid filling, then there is a lack of communicating veins (Fig.131,b). You can determine the location of insufficient communicators, for which the test is repeated several times and a tourniquet is imposed above and below the site of greatest vein filling. If after getting up the vein between the tourniquets fills faster than above and below the tourniquets, then insufficient communicating vein is located between tourniquets (Fig.131). When the tourniquet is removed from the thigh immediately after getting up, the rapid filling of the veins from top to bottom indicates the insufficiency of the ostial valve of the great saphenous vein (Fig.131, b).

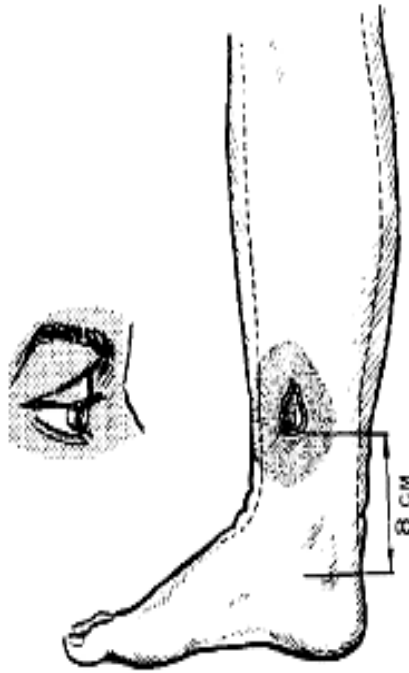


Fig.131 a. Varicose symptom complex

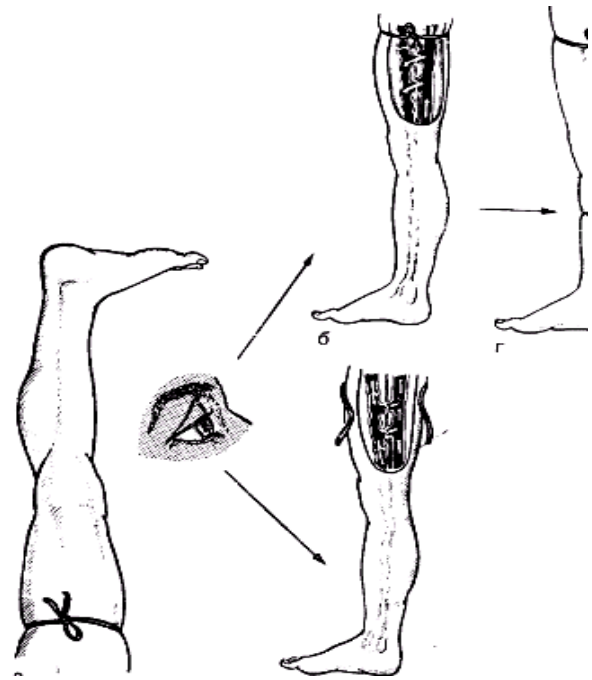


Fig. 131 b. Troyanov-Trendelendurg test

Insufficient communicating veins can be detected using the *Pratt test* (Fig. 132): the subject is placed in a horizontal position. Then the leg is raised, veins are emptied, bandaged with an elastic bandage, starting from the base of the toes to the middle third of the thigh. Bandaging from the bottom up and the next from top to bottom is done so as to achieve the desolation of only the subcutaneous veins.

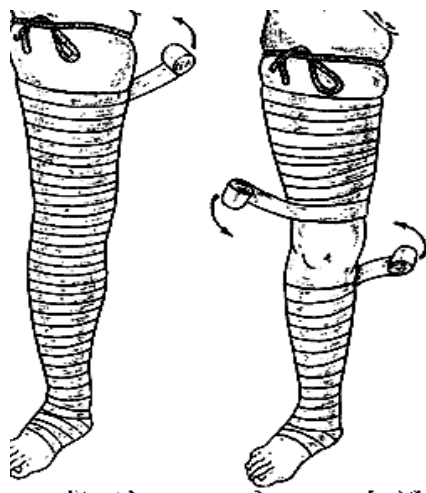


Fig.132. Pratt's test for defective valves of the connecting veins.

Then the patient is placed and with the help of a second elastic bandage the leg is bandaged, starting from the upper third of the thigh down so that between the two bandaged areas there is a free surface that does not exceed the width of the palm. After that, the lower bandage is removed, and the upper bandage is continued in the direction of the shin. The appearance of varicose veins and their location indicate the presence and location of communicating veins with insufficient valves. Now at the filled veins at the standing patient it is

possible to impose a plait and to ask the patient to come. This *Delbe-Perthes test*

(march test) checks the patency of deep veins. If the varicose veins collapse when walking, the deep veins are passable. A sign of insufficiency of the valves of the leg veins in varicose veins is: when the patient coughs, a wave of moving blood is visible in the subcutaneous veins of the leg in the direction of the pads (*Sikar's sign*). Mayo and Pratt's test is that with the help of an elastic bandage or elastic stockings compression is achieved of all subcutaneous veins of the lower leg and thigh. Then ask the patient to walk for 30-40 minutes. If the swelling does not increase, the pain does not increase, and the subcutaneous veins do not strain, the deep veins are permeable.

Spilled edema of the limb, which does not disappear in the supine position, indicates a blockage of the deep veins. For assessment and treatment, it is important to identify subfascial venous insufficiency. Edema, cyanosis, induration on a large area indicates deep venous insufficiency. Veins that lie superficially, primarily on the thigh, are called panicles. More often they are found at the lowered elasticity of skin and do not represent a true varicose vein.

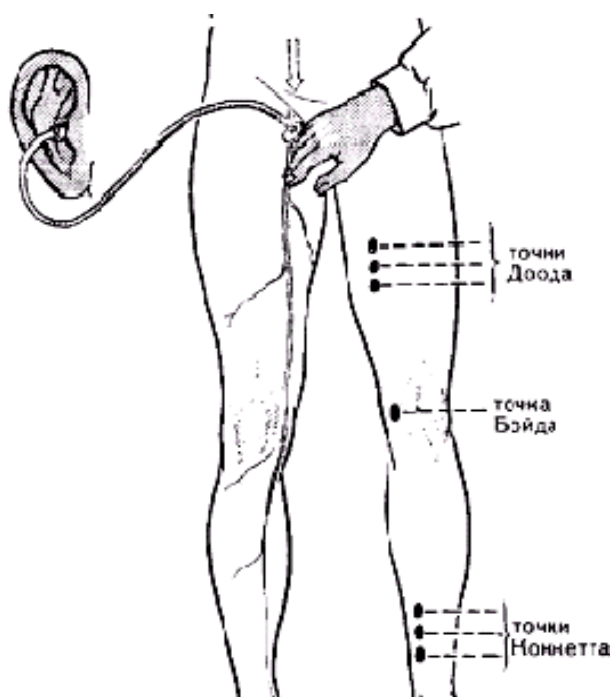


Fig 133. **Palpation of the widened fascia opening.**

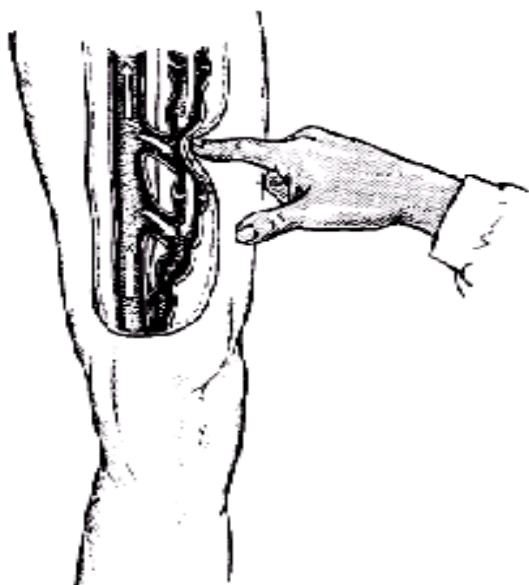


Fig 134. Palaption of deep saphenous vein and listening for the sound of the reverse blood circulation at coughing (on the right), location of important communicative veins (on the left).

At a palpation it is possible to feel places of an exit through a fascia of insufficient communicating veins in the form of the expanded opening in a fascia that is important at operation (Fig. 133). The main locations of the communicating veins are 8-14 cm above and behind the inner block along the Coquette line, above and behind the knee joint at the Boyd point and in the lower third of the thigh on the inner surface along the Dodge line (Fig. 134).

Sometimes there are difficulties in the differential diagnosis of femoral hernia and varicose veins. *Caudi's sign* can serve for this purpose: if the patient constantly tightens a stomach, the doctor at a palpation of a protrusion in case of a varicose vein perceives vortex movements that is not present at a femoral hernia.

**Thrombophlebitis.** Phlebothrombosis and phlebitis are inseparable from



Fig.135. **Phlebothrombosis.** Palpation of the tense bed of the calf muscles.

each other and are most often observed simultaneously. In case of the injury of superficial veins - inflammatory, and in case of the injury of deep veins - thrombotic component comes to the fore. At examination it is possible to see hyperemia, swelling, pain. Superficial vein thrombosis can be felt as a local painful formation.

If deep veins are thrombosed, then pain is noted at palpation in calf muscles and tension of a back surface of a shin (fig. 135). Active and passive dorsiflexion of the foot also causes pain in the calf muscles (*Homan-Horman sign*). There is also pain when pressing on the medial edge of the tibia in the lower third of the leg (*Meir's sign*). Sometimes deep thrombophlebitis can be diagnosed

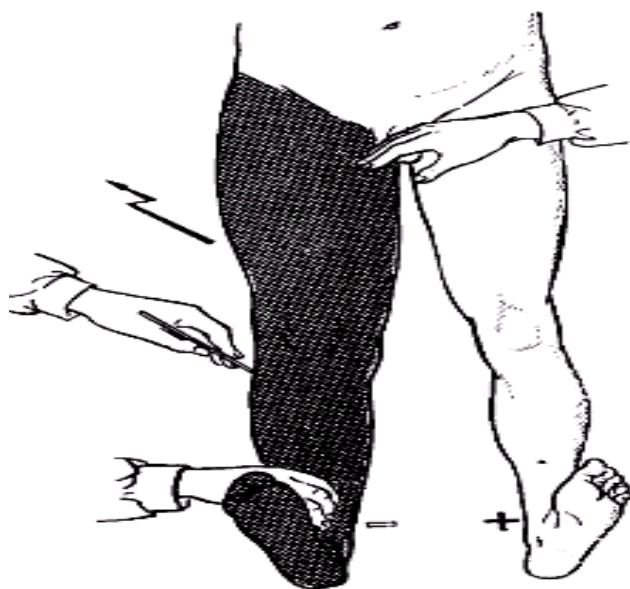


Fig.136. *Pphlegmasia cerulea dolens*

by increasing the circumference of the limb, periodically measuring it. Sudden blockage of all veins of the limb is characterized by pain, edema, cyanosis, cold and loss of sensitivity. In the late stage, no pulse. The reason is unknown. This disease is called *phlegmasia cerulea dolens*, it can be recognized at examination. In most cases, "venous gangrene" develops within 4-8 hours (Fig. 136).

Inguinal-femoral venous thrombosis leads to the development of *white phlegmas*. The affected leg is pale, painful, has a dense swelling in a horizontal position. The skin becomes shiny, it has a marble color. When lowering the leg down at the site of pallor there is a pronounced cyanosis. This is due to the arterial compression, peripheral pulse is absent or weakened. This disease carries a high risk of pulmonary embolism or later - *severe postthrombotic syndrome*.

A less dramatic complication is subclavian vein thrombosis: swelling of the arm, movement disorders, and sometimes pain. In the late stage, collaterals are

seen in the upper sternum, which confirms the diagnosis of this "blood clot". One of the reasons may be costal-arc syndrome.

**Postthrombotic syndrome** develops as a consequence of deep thrombophlebitis and leads to chronic venous insufficiency. It is accompanied by recurrent varicose veins, fatigue, cramps in the calf muscles, severe edema. Often in the lower third of the leg trophic ulcers that extend to the entire circumference of it are formed.

### Mammary gland

**General examination technique.** In the anamnesis the most important will be the information that leads patients to the doctor. It is necessary to take note of

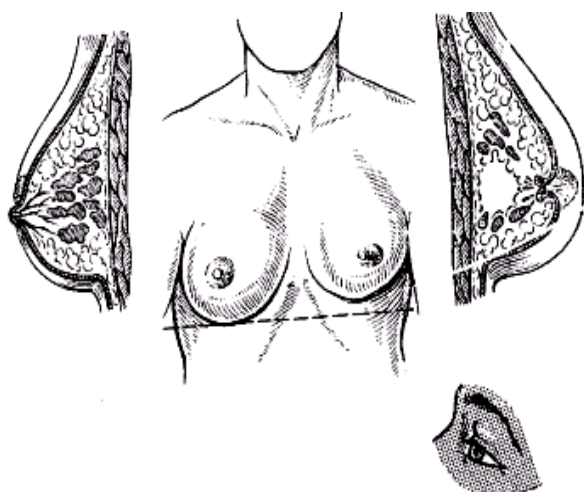


Fig.137. **Comparative examination of the mammary glands in a standing or sitting position.** Raised position of the left breast and retraction of its nipple in cancer (see lumbar section).

any indication of pain, detected node or separation from the nipple, because they may be a manifestation of a malignant tumor. Early diagnosis can be difficult, but crucial for prognosis. Fear of cancer forces many patients to reduce their complaints. If a node is palpated in the breast, she tries to link its appearance with injury. On a truly traumatic basis, only fatty granulomas occur.

The comparative examination is performed first with the arms lowered and then with the arms raised. Determine the position of the nipples on both sides (Fig. 137). Because the shapes of both mammary glands do not completely coincide in any case, it is only possible to assess the recent change. With a flat or retracted nipple, a reminder of the difficulty of feeding the baby suggests that this anomaly has existed before.

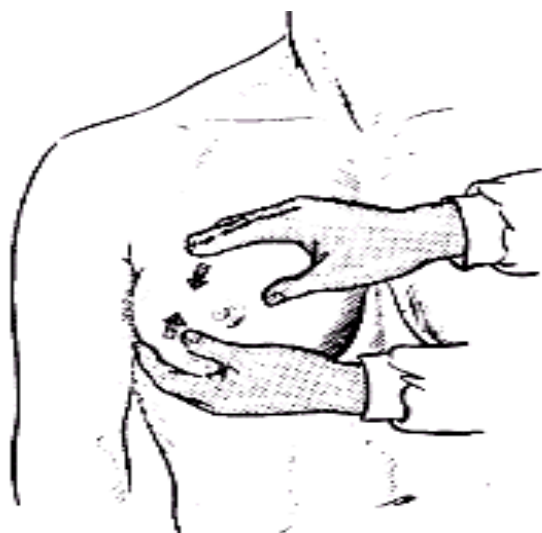


Fig.138. **Bimanual palpation of the breast in a standing or sitting position.**

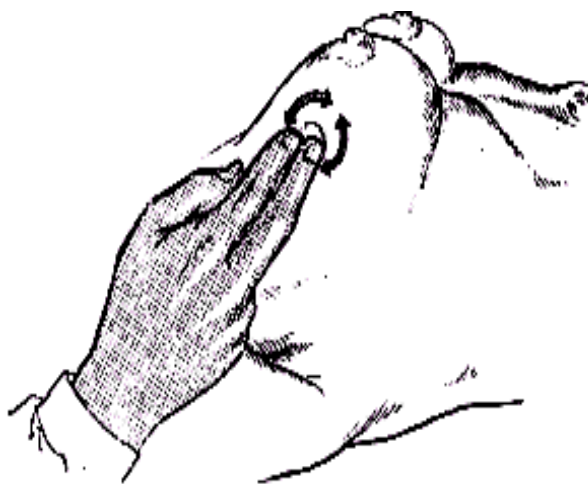


Fig.139. **Palpation of the breast with one hand in a supine position:** assessment of the mobility of the tumor.

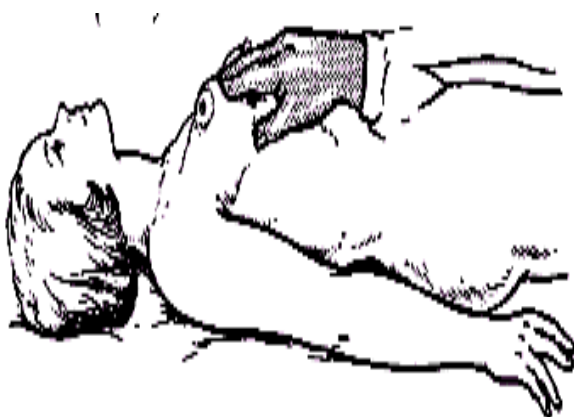
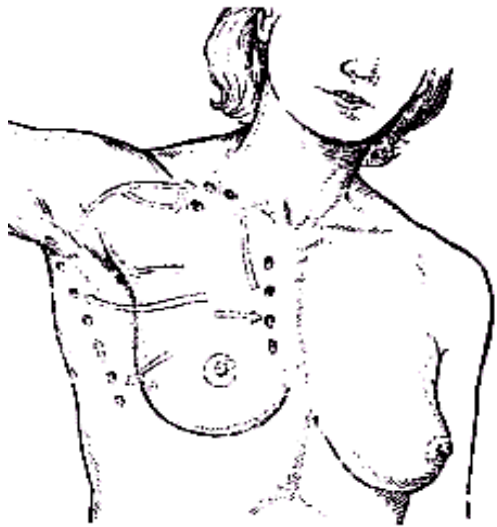


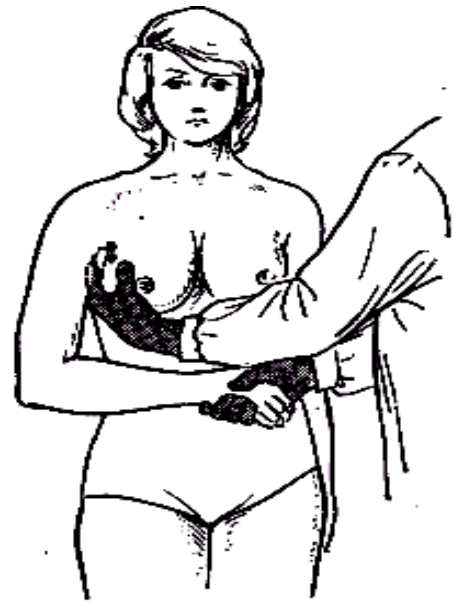
Fig.140. **Palpation with two fingers to assess the surface and**

Palpation is performed first in the position of the patient sitting or standing, while both mammary glands are palpated separately from each other and in comparison with both hands at the same time (Fig. 138). Then palpate with one hand in a supine position. This allows you to better feel the tumor over a solid chest and easier to determine its mobility than in a standing position (Fig. 139). The surface and connection of a neoplasm with surrounding fabrics is best defined by means of insignificant rotational movements or three fingers (fig. 140)

Mobility in relation to the pectoral muscle and its fixation is checked with a contracted muscle, while the patient withdraws her hand on the affected side to a right angle, actively tensing the muscle; in this position, the tumor may be immobile (*sign of Ri*). Further examination is aimed at finding metastases (Fig. 141). For palpation of the axilla, the doctor stands in front of the patient and takes her hand.

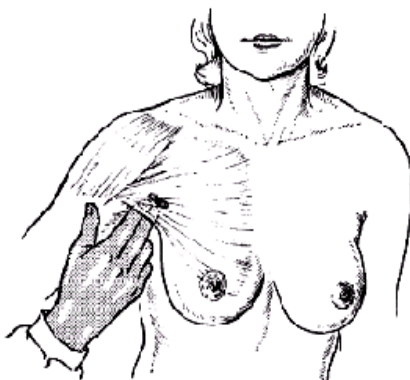


**Fig.141. Lymphatic drainage from the breast.** Supernodal lymph nodes are not affected directly, but only through the external or internal lymphatic system.

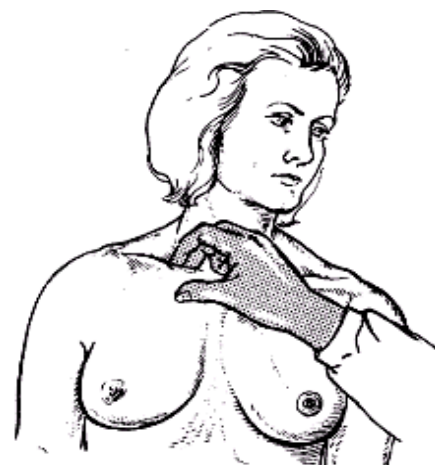


**Fig.142. Palpation of inguinal lymph nodes in a standing position.**

With the fingertips of the other hand, the axillary fossa is palpated, while the patient relaxes the hand as much as possible (Fig. 142). Metastased lymph nodes are more likely to be located in the gap between the pectoralis major muscle and the widest back muscle. Then the doctor feels with two fingers supra- and subpharyngeal (Fig. 143), pectoral, and by moving the fingers from below under the pectoralis major muscle other lymph nodes (Fig. 144).



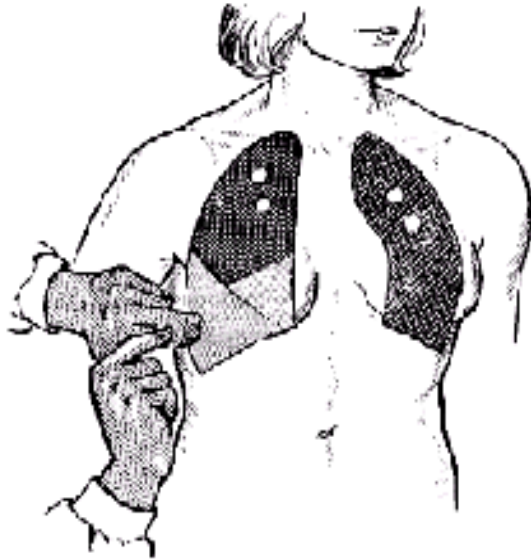
**Fig. 143. Palpation of lymph nodes located between chest muscles**



**Fig. 144. Palpation of lymph nodes**

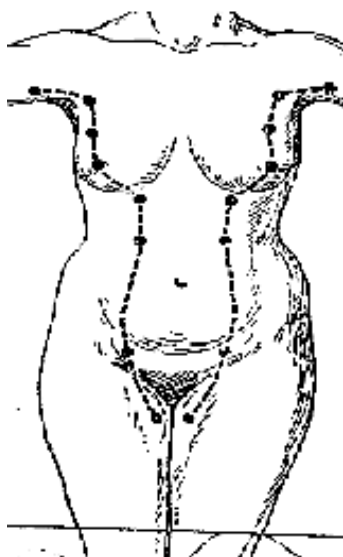


Metastasis can occur in the opposite gland and in the subscapular lymph nodes. Metastases in the lung can be suspected on the basis of the appearance of pulmonary effusion (Fig.145). Bone metastases are manifested by pain or pathological fracture or thickening, which is palpable (especially in the ribs).



**Fig.145. Excretion in the pleural cavity as a side symptom of lung metastases or carcinoma.**

**Abnormalities.** Because the shape and size of the breast varies greatly from individual to individual, only the absence of mammary glands is considered a defect, their location in an unusual place or more underdevelopment in the form of aplasia or amastia (without any hint of breast sucking) are much less common than multiple suckers (polythelia) or glands (polymastia), as well as an additional or



**Fig.146. Scheme of milk lines**

aberrant gland. *Polythelia* and *polymastia* are recognized by their position on the line connecting the genitals and the axillary fossa - the embryonic milk border (Fig. 146). Separated glandular tissue (aberrant mammary gland) is most often localized in the axilla. It increases during lactation, can become inflamed and turn into a benign and malignant tumor. If the basis of the defect is flat or retracted breast lobes (inversion), then these changes are observed on both sides and exist since childhood. Unilateral retraction of the sucker, which formed later, suspected a malignant tumor. In such cases, the suckers are not located on a single horizontal line (*Forge's sign*).

**Purulent mastitis** is most common in the postpartum period. If it was not preceded by pregnancy, it is always worth remembering that under the guise of mastitis cancer and tuberculosis can hide.

**Breast tumors** occur mainly in women, but occasionally in men. If the patient complains of pain in the breast, it is necessary to find out its temporary dependence on menstruation. Pain that appears during menstruation indicates mastopathy. Malignant tumors do not usually cause pain. However, the appearance of pain in them is much more common than previously thought. The pain may even precede the palpable tumor. The pain is localized or irradiated to the surrounding tissues (especially in the axilla) and does not depend on menstruation.

The following points contribute to the differential diagnosis:

- breast cancer is often familial;
- most often women with cancer who have not had one or have had less than two pregnancies;
- malignant tumor grows, usually rapidly, changes in mastopathy remain stable for a long time;

The right breast is affected more often than the left one. The upper outer quadrant is the most common location. On the contrary, mastopathy develops on two sides. The node in the body of the gland may be due to fibroadenoma. Post-traumatic fatty necrosis (granuloma) can manifest as a solid tumor. An accurate diagnosis can be made only after histological examination. In *cyclo-fibrous*

*mastopathy of Reclus-Schimmelbusch*, the mammary glands resemble a bag with a fraction or with balls. Sometimes it is possible to feel in a parenchyma of a

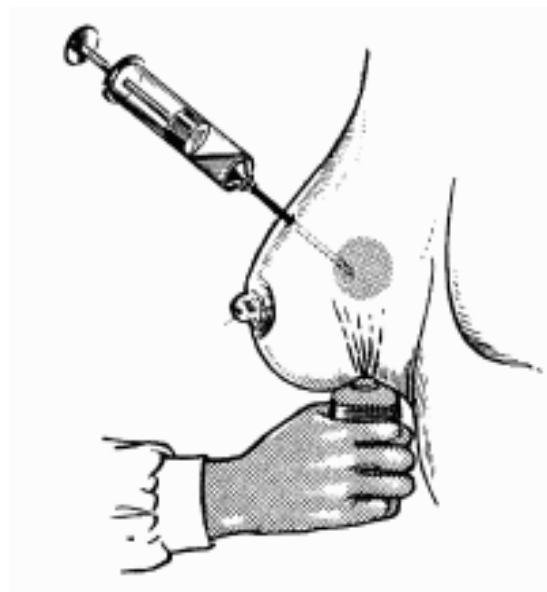


Fig.147. **Diaphanoscopy and puncture in cyclo-fibrous mastopathy of Reclus.**

mammary gland of a cyst of dense-elastic consistence and palpatorily painful in the premenstrual period. This disease affects most breasts in most cases. Positive diaphanoscopy, cyst puncture (Fig. 147), mammography or ultrasound (US) can be used to clarify the diagnosis. In fibroadenoma, the formation is solid with clear boundaries, shifting with the body of the gland. However, physically it is impossible to distinguish with absolute certainty from a malignant neoplasm.

Breast cancer has several cognitive features. However, an accurate diagnosis is established only by histological examination. Due to cancerous infiltration and germination of the

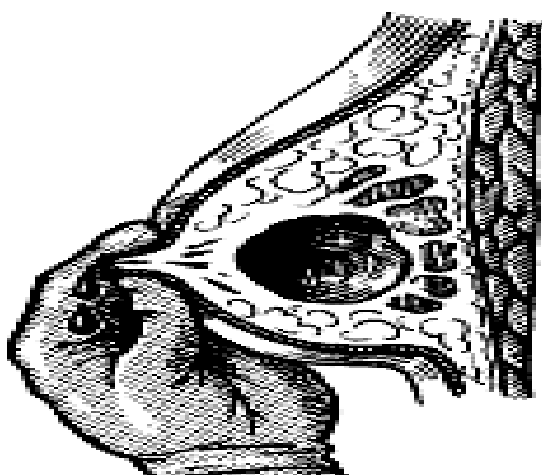


Fig.148. **Squeezing the selection of the nipple of the breast with two fingers.**

excretory ducts, the nipple may be retracted. The growth of the tumor of the mammary ducts is also evidenced by the *sign of Pribram*: the doctor holds the tumor with one hand and pulls the nipple with the other. If the tumor extends beyond the nipple or when the tumor is pushed to the top, the nipple of the breast is retracted, which indicates breast cancer. A special diagnostic difficulty

may be given by the sectarian breast. The discharge obtained by squeezing the nipple with two fingers (Fig. 148) should be distinguished from pus, bloody discharge or discharge in the form of meat slops.

Pus indicates an inflammatory process, and bloody discharge - often a malignant tumor. Mastopathy can cause the secretion of the gland before menstruation. Non-menstrual discharge indicates cancer or *intracanal papilloma*. In such cases, mammography or cytological examination of the discharge is required for diagnosis. A special form of malignant tumor, which progresses slowly, is *Paget's disease* - nipple of the breast. There is a sharply defined eczematous hyperemia with desquamation and wetting around the nipple. The surrounding tissues are infiltrated.

In lactating women, mastitis-like breast cancer may be more common in old age. In some rare cases, cancer cells infiltrate the skin of the breast and breast, forming a shell that makes it difficult to tour the chest - *shell cancer*.

Sometimes polyuria (metastases to the pituitary gland is a symptom of Simon) is observed in patients with breast cancer. A small area of skin can also be involved, which leads to the appearance of a symptom of orange peel (Fig.149 a,b). With cirrhotic cancer, there is sometimes a decrease or elevated position of the

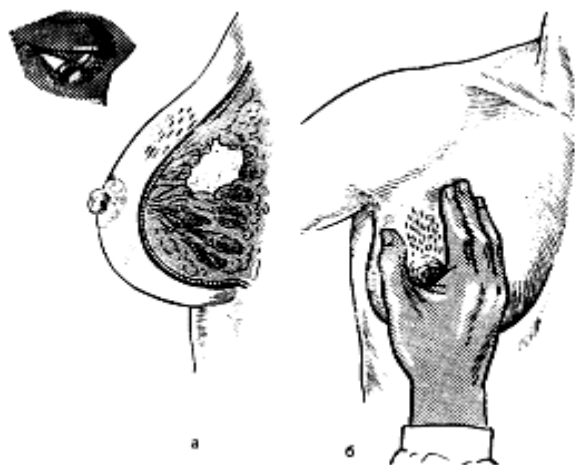


Fig.149. **Skin in the form of an orange peel in breast cancer:**  
a - examination; b - palpation.

breast. Palpation reveals a bumpy tumor, irregular in shape and woody density, which is difficult to distinguish from fibroadenoma, if there is no fusion with the surrounding tissues. In each case it is necessary to check mobility in relation to skin: at its germination attempt here to take skin in a fold not small, and incorrectly located small lumbar wrinkles (*Paira's sign*) and fascia of a pectoral muscle are formed. In order to distinguish

a breast tumor from a cyst, in the supine position the doctor places his palm on the breast. At the same time cysts disappear (allocation is squeezed out in milk courses), and tumors do not change the features (*Koenig's sign*). A sign of colloidal breast cancer: a slight compression of the formation of the fingers gives

the impression that its capsule ruptures and the jelly-like substance liquefies, despite the fact that the size of the tumor does not change (*Halsted's sign*).

### **Digestive System**

**Esophagus.** Esophageal disease can be determined by such symptoms:

- swallowing disorder (dysphagia);
- hematemesis and / or melanorrhagia;
- burning or pain in the chest;
- pathological salivation.

*Dysphagia* in most cases progresses. At first there are difficulties for passing of firm food and then more and more soft, and at last liquid. Vomiting of undigested food is called *regurgitation*. Prestenotic dilatation of the esophagus is more pronounced as slower development of stenosis. There is an unbearable smell from the mouth. When eating, the vagal reflex is not interrupted due to the fact that food does not enter the stomach, so it has been produced pathological salivation, reflex sialorrhea. Hematemesis and / or melena often can be suspected. The pain is localized behind the sternum and radiates to the xiphoid process, the lower jaw and in the thoracic region or between the shoulder blades. Typical pains occur after eating. The transition of the process to the respiratory tract is manifested by coughing or aspiration of food into the lungs.

*Burns* after accidental or intentional intake of strong acids or alkalis. Alkali poisoning is more dangerous, because due to the melting of the esophageal wall, it quickly leads to the development of mediastinitis, but acid burns are more painful.

*Acquired varicose veins* of the esophagus is a consequence of portal hypertension and is localized in the distal esophagus. It is formed from the increased intravascular pressure as a result of obstruction of blood flow through the diseased liver (intrahepatic), prehepatic narrowing or thrombosis of the portal vein, or posthepatic block. The veins of the esophagus can not withstand an increase in the pressure: they rupture, there is a massive, life-threatening bleeding. The next symptom of portal hypertension is collaterals, through which blood is drained from

the portal vein to the inferior vena cava (portocaval anastomoses). The visible collaterals on the abdominal wall are called the *head of a jellyfish*. Round circulation through the hemorrhoidal plexus leads to the development of secondary hemorrhoids. In most patients, portal hypertension is caused by cirrhosis of the liver. In the late stage of liver cirrhosis there are ascites and splenomegaly.

*Gilbert's sign* may be a sign of liver cirrhosis: the amount of urine increases during fasting and decreases during the resumption of food intake (*opsuria*).

**Abdomen.** General examination technique. Examination of the abdomen is a difficult task, it requires from the doctor the sensitivity of the fingertips. Assessment of the pathological process in the abdomen is based on the experience of a doctor. It is not superfluous to repeat that visceral pain comes from the hollow organs of the gastrointestinal tract, it is caused by stretching or spasm and is carried out on both sides by the celiac nerves. Tissue damage, burns, dissection and puncture of the wall of the gastrointestinal tract and large omentum do not cause pain. Visceral pain is intermittent, decreases during movement, is diffuse in nature. It is often accompanied by nausea, vomiting, paleness and sweating. Somatic pain comes from the parietal peritoneum, mesentery of the small and large intestines, small omentum or epigastric space. It is carried out on somatic sensitive fibers, happens asymmetric, constant and strictly limited. Movement or concussion increases the pain. The forced position with bent legs reduces the pain coming out of the extrauterine space.

It is recommended to collect the anamnesis in the following sequence:  
What? When? Why?

**What?** The nature of the pain is clarified. By which you can judge the affected layers of the body wall. Heartburn comes from the mucous membrane (inflammation or defect). It is caused by the reaction of the surrounding tissues (damage to the mucosa does not cause pain). Pressure in the form of a feeling of fullness or swelling, which can lead to dull pain, is caused by stretching of the deep layers (visceral nature). Contractions, which can increase to colic and, in extreme cases, resemble childbirth (obstruction of the small intestine), are a

manifestation of the contraction of smooth muscle, trying to overcome the obstacle in the hollow organ (visceral pain). Drilling pain, in contrast, indicates an inflammatory disease in the outer layers of the wall and serous membrane or their cancerous growth involving the parietal peritoneum (somatic pain). Nausea occurs reflexively as a result of difficulty in emptying the upper digestive tract or increased pressure in the hollow organ. It stops after vomiting if the cause is in the upper gastrointestinal tract, and does not pass if it was caused by increased bile duct pressure or high intracranial pressure.

**Where?** Exact localization is possible only at somatic pain.

**When?** Some abdominal diseases have a clear time dependence. We distinguish: *periodic pain* (seasonal – autumn, spring; hour – night, day), dependence on food intake; *abdominal sore throat*: increased pain after eating, duodenal ulcer: reduced pain after eating. *Episodic pain* occurs in the form of attacks that are not ordered in time. The exacerbation episode is short, but the disease persists (example: gallstone disease). Constant pain is unstoppable, wavy or increasing in strength and does not stop for a single day. It has a somatic nature (for example: cancer that grows in the parietal peritoneum). At disorderly pain duration, character of pain change and quite often it is possible to establish its dependence on emotional pressure (for example: excitable colon).

**Why?** Try as much as possible to find out the cause of pain in addition to the emotional nature and the nature of food, the pain may arise from the position of the body (curved or horizontal) in case of hernia in the esophageal orifice of the diaphragm. It is necessary to find out whether there have been abdominal surgeries in the past. Then proceed to the detection of functional disorders: the nature of the stool; gas and / or stool retention as a symptom of intestinal obstruction; wobbly stool (disorderly alternation of constipation with diarrhea) indicates a process that stenoses in the colon; painful urge to stool (tenesmus) or involuntary excretion of feces with flatulence – a symptom of suspected rectal cancer; blood admixture to the stool or tarry stool (ground) – a symptom of gastrointestinal bleeding; repeated stools during the day in equal portions – an indication of nervous, motor or

inflammatory disorders, as well as disorders of absorption and digestion (for example: chronic pancreatitis).

The phenomenon of incontinence – a pronounced disease of the anus. If the patient vomits undigested food, the stenosis is located above the cardia, if the vomit is mixed with gastric juice, the stenosis is at the level of the gatekeeper. Impurity of bile excludes full occlusion of gastric ways, and the obstruction is located below the Vater nipple. Fecal acid vomiting indicates a delay of feces above the stenosis and occurs in the final stage of intestinal obstruction. At high impassability (transition of a duodenum to a skinny) vomiting appears early, and at

colonic impassability more often only in the second – the third week.

**General examination.** The pain is often noticeable on the patient's facial expression, even when he/she does not talk about it. A pale face with drooping cheeks and a failed face with a pointed nose, raises the suspicion of abdominal

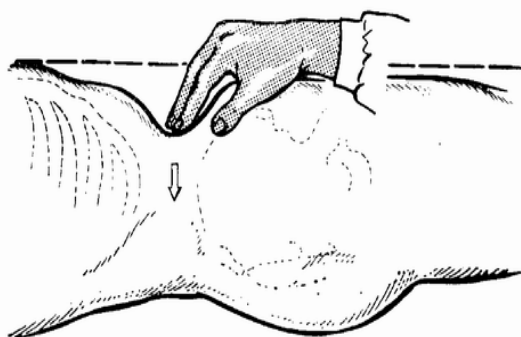


Fig.150. Examination and palpation of a normal abdomen - the abdomen is painless and soft.

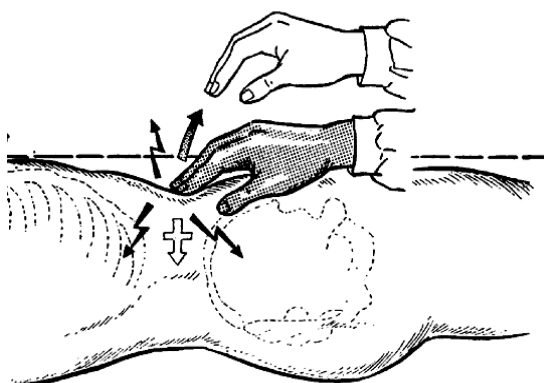


Fig.151. Protective tension and pain after removal of the arm with peritonitis. The abdomen is below the level of the chest. Arbitrary muscle tension or spasm can simulate protective tension. However, there is no tension and pain when pressing and removing the hand.

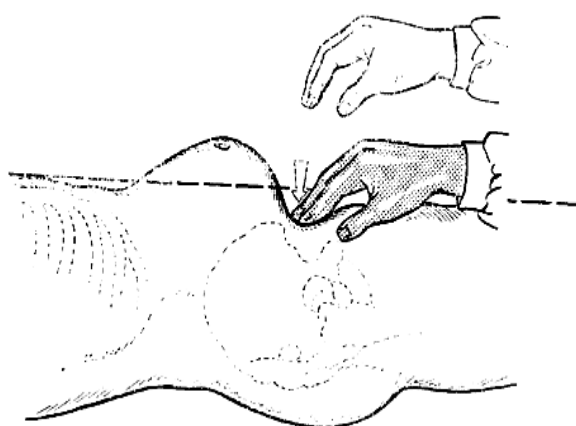
disease, often involving the parietal peritoneum (abdominal face or the face of Hippocrates). The skin and tongue are often dry. Normally, in the supine position, the abdomen is located below the level of the chest (Fig. 150). The tension of the abdominal wall can be muscular or peritoneal (Fig. 151). If the abdominal wall is located above the chest, it is obesity or ascites (Fig. 152). If that change developed in the process of the



disease, then it can be caused by the intensively swollen intestine at with flatulence, obstruction or tumor growth.

The thin abdominal wall sometimes allows to see pathological peristalsis of intestines, a tumor or an abscess. If such a change is formed only on one side, then a comparative review is important.

The location of the scar on the abdomen will allow us to conclude about the type of surgery, which is not always likely known to the patient. It is also possible to say about the localization of the not natural anus. It is important to clarify, whether a single- or double-barreled fistula was imposed.



**Fig.152. Abdomen protruding above the level of the chest in obesity, ascites, flatulence or intestinal obstruction.**

If there is no peritonitis, then there is no protective tension, pain when pressing and removing the hand.

It is visible on the inverted mucous membrane with one or two lumens. In unexplained cases, one or two intestinal canals can be traced with a gloved finger.

Warm hands are a prerequisite for successful palpation. For palpation of the abdomen, the patient is placed with outstretched legs and hands pressed to the sides. Palpation of the abdomen should begin where

there is no pain (for example: if you suspect appendicitis – on the left side). This is based on the fact that after causing pain, arbitrary relaxation of the abdominal wall, even in a healthy area, often becomes impossible. First, a superficial palpation is performed. At a palpation of an aponeurosis it is necessary to ask the patient to lift actively the upper half of a body and to look for changes in it (a hernia of a white line of a stomach, a Spiegel ernia). Inflammation of the parietal peritoneum is manifested by reflex tension of the muscles of the abdominal wall of the patient. If there is local peritonitis, the protective stress can be determined by comparative palpation on the opposite side. The degree of protective stress can vary from

insignificant (rigidity) – at the beginning appendicitis, to board-like – perforation of body.

An experienced surgeon with acute appendicitis complicated by local peritonitis, palpates the shortened bundles of the external oblique muscle of the abdomen, resembling taut strings ("strings of appendicitis" or *Chugaev's sign*). At percussion of a stomach a finger in a place of an inflammation of a parietal peritoneum there is a pain - (*Razdolsky's sign*). At slow pressing by a hand on a stomach the patient almost does not feel pain at an inflammation or irritation of a peritoneum. Acute pain appears with rapid withdrawal of the hand (*Shchetkin-Blumberg sign*). Signs of peritoneal irritation or significant stretching of smooth muscles (gas, movement of stones): with a light tap of the fingertips on the abdominal wall there is pain (*Mendel's sign I*). If when pressing and removing the

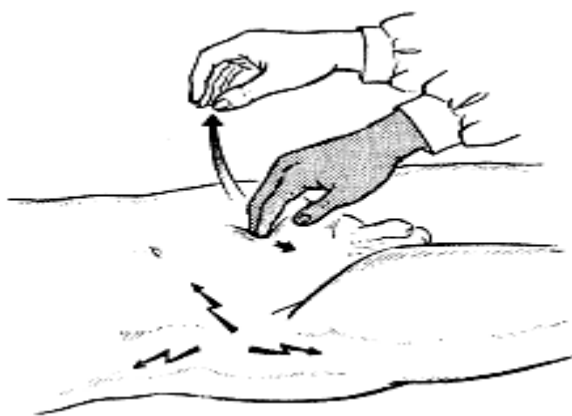


Fig. 153. Cross pain when removing the hand with local peritonitis in the lower abdomen on the right.

hand, the pain occurs on the opposite side of the test site, then talk about cross pain from unloading (Fig. 153). Gentle tapping with the tips of all fingers can also cause cross pain from tapping.

Deep palpation follows superficial palpation of the abdomen. First, the lying patient is palpated to determine the edge of the liver on a deep breath. Palpation of the spleen is easier to do on the right side with bent knees and left hand thrown over the head. The doctor is on the right and palpates with both hands. The left hand at the same time moves to the hypochondrium in an oblique direction from below and from the inside out, at the same time the right hand behind pushes it to meet the left hypochondrium. But the doctor can also be located to the left of the patient and feel the left hypochondrium with both hands, superimposed on each other. Normally, the spleen is covered under the costal arch. Only an enlarged spleen can be felt. It also shifts when breathing. Deep palpation of other parts of the abdomen should be done with the superimposed palm of the hand, while the

other hand presses on its floor. With the help of light movements of both hands in front – behind and on the sides it is possible to determine the boundary, assess the surface, consistency and mobility of the formation. In a normal abdomen, thin patients can palpate the aorta, spine, sometimes the cecum and the lower edge of the liver. All other organs are not palpated. An overflowing stomach or bladder is manifested as a diffuse, not completely demarcated formation, without being pathologically altered. All other formations are pathological. The examination should not be painful. On deep palpation, something resembling pain may occur. The sensation will be normal if on comparative palpation on the opposite side it will be of the same intensity. If there is a reflex protective voltage, then deep palpation will be very painful and in most cases impossible. It is not necessary to do it by force. Individual areas of the abdomen can be examined more accurately with the help of special techniques.

**Stomach.** In uncomplicated gastroduodenal ulcers, the anamnesis is extremely important. However, these diseases are within the competence of physicians, gastroenterologists. The absolute indication for surgery occurs in complications of peptic ulcer disease.

**Perforated ulcer.** The patient complains of excruciating dagger or piercing pain, especially at first. The general condition of these patients can be described as a shock: the expression of fear, the position of patients is always forced (thighs are reduced to the abdomen), paleness, cold sweat, rare (vagal) pulse – *a sign of Grekov*. The abdomen is tense, drawn in, "board-shaped", the symptom of Shchetkin-Blumberg is positive. Due to the release of gas into the free abdominal cavity, there may be no hepatic dullness clinically (*sign of Spizharny, Clark*).

At a review roentgenography it is possible to find gas under a diaphragm dome After 2 hours there is a period of imaginary /sham/ well-being: there may be euphoria, improving common condition short time but increased heart rate, bloating after 6-12 hours there is a vivid period of peritonitis.

**Ulcerative bleeding.** The main and often the only sign is bloody vomiting or vomiting "coffee grounds". At first there is a sudden weakness, dizziness. Black

stool (ground) occurs in all cases of gastric bleeding. In cases where patients constantly suffer from abdominal pain, the onset of acute gastroduodenal bleeding is preceded by a period of complete remission of pain (*Bergman sign*). In the hands of a doctor who diagnoses a patient with acute gastric bleeding, there is no more powerful diagnostic weapon than a carefully collected case history. Fibrogastro-duodenoscopy makes possible to determine the source of bleeding, whether the bleeding continues and what its nature is.

*Cicatricial stenosis of the portal vein* is manifested by delayed gastric contents and vomiting, which brings relief. Vomiting masses consist of undigested food mixed with gastric juice and unstained bile. Patients develop dehydration and cachexia. Stenosis develops exclusively due to duodenal ulcer or antral cancer. Sometimes peristaltic waves of the stomach can be traced on the anterior abdominal wall, and in case of concussion on an empty stomach – a sign of a splash (*Vasylenko sign*). The final diagnosis is established by gastroscopy, biopsy and X-ray (graphy) of the stomach.

*Gastric tumors* in most cases are malignant (cancer). Small cancers metastasize early, and large ones have a lower tendency to metastasize. In the initial stages of the process in 1914 V.S. Levit described the sign of small symptoms:

1. the appearance in recent times of general weakness, fatigue, insomnia, reduced efficiency;
2. persistent decrease or loss of appetite, up to aversion to food, or to certain foods (meat, fish);
3. feeling of weight or pressure in the underlying area, belching;
4. progressive weight loss without any trivial reasons;
5. increasing anemia;
6. psychological depression, apathy.

Aboral tumors (most often) lead to stenosis early, and tumors of the body and bottom almost do not exclude free passage. Sometimes tumors are palpated as

a solid, bumpy formation. Metastases should be sought in the liver, so called upper metastasis, in the ovaries - *Krukenberg metastasis*, in the women navel.

*Acute appendicitis*. In the first place there is a constant abdominal pain. More often it appears in the right iliac region. Primary localization of pain in the subcutaneous area (*Volkovich-Kocher sign*) is often observed in case of destructive appendicitis. Rarely, the pain is compressive. Subsequently, the pain from the subcutaneous area moves to the right iliac. Objectively: pain, muscle tension and a positive *sign of Shchetkin-Blumberg* in the right iliac region. *Sitkovsky sign*: at position of the patient on the left side pain in the right iliac area owing to shift and tension of the excited shoot and its mesentery amplifies; *Bartomier-Michelson's sign*: palpation of the right iliac region in the position of the patient on the left side is more painful than on the back; symptom of slipping shirt, *Voskresensky*: on the stretched shirt the surgeon's palm quickly slides from hypochondrium to pupart's region. At an acute appendicitis the pain is noted only on the right.

The greatest diagnostic difficulties of acute appendicitis arise at an atypical arrangement of an appendix. With retrocecal (retroperitoneal) location of the appendix, the pain in the right iliac region is mild. The most important sign of the disease is pain in the lumbar region, tension in the side wall of the abdomen, often a positive *sign of Pasternatsky* (pain when beating the right half of the lumbar region and a small admixture of erythrocytes in the urine). Often retrocecal appendicitis occurs from the beginning with the phenomena of severe intoxication – fever, chills, etc. A.V. Gabay proposed to determine the presence of the Shchetkin-Blumberg sign in the area of the right petit triangle. *Cope's test*: the patient is placed on the left side, the right lower limb in an upright position is taken back. Muscle resistance and pain in the right iliac region are regarded as a sign of acute appendicitis. *Kobrak's sign* (a sign of retrocecal appendicitis): the patient lies on the left side, knees are pressed to the abdomen; the doctor directs his/her index finger (in rectal examination in men and vaginal in women) up and

to the right; when pressing in this place on the closing (membrana obturatoria) membrane, the patient feels severe pain.

With the medial location of the condyle, pain often occurs in the left iliac region. Liquid stool, accelerated urination, incision is observed in the pelvic location of the condyle.

In older children, abdominal pain appears suddenly, without predictors. In the first days the pain is most intense, then it decreases. Vomiting once or 2-3 times is a frequent symptom. *Filatov's positive sign*: local pain in the right iliac region. In young children, vomiting, fever, mismatch of temperature and heart rate - "scissors" are more common. From the beginning, children are lethargic, capricious, disturbed sleep and appetite. Chloral hydrate enema is recommended to relieve psychoemotional reactions. After the cleansing enema, a rubber catheter (15 cm) is inserted into the rectum, a warm solution of 3% hydrochloride is injected through it: up to 1 year old - 10-15 ml, from 1 to 2 years old - 15-20 ml, from 2 to 3 years old - 20- 25 ml. In 15-20 minutes a person falls asleep during which tension of muscles and the Shchetkin-Blumberg sign remain. We successfully use another technique: the child's mother takes him/her in her arms and calms him/her down. The doctor's hand rests on the child's abdomen. At palpation of the right iliac region and in the presence of acute appendicitis, the child begins to cry and break out of the mother's arms.

In pregnant women, the ileocecal angle is pushed up by the enlarged uterus. The signs of acute appendicitis should be checked in the position of the patient on the left side, when the right iliac region is released from the pregnant uterus. Michelson describes a sign of acute appendicitis in pregnant women: increased pain in the right half of the abdomen in the position of the patient on the right side due to pressure on the irritated appendix. Differential-diagnostic sign of acute appendicitis and acute adnexitis: the patient is in a supine position, press the finger against the abdominal wall at a point 2 cm to the right and below the navel, offering her to stand up; increasing pain indicates appendicitis, reducing it - adnexitis (*Zhendrinsky's sign*).

**Douglas space abscess** is a limited accumulation of pus, it occurs in the lowest part of the abdominal cavity. Patients complain of accelerated loose stools, tenesmus, sometimes frequent urination, difficulty in excreting urine, urinary retention. At finger research of a rectum relaxation of an oppression of an anus, bad maintenance of gases and feces, protrusion of a mucous front wall of a rectum (*Blumer's sign*) is noted. The diagnosis is confirmed by a puncture of the overhanging wall of the rectum, for which a rectal mirror is inserted into the anus and its branches are diluted.

At a subphrenic abscess pains are felt differently from those in the lower part of a thorax on the right. Sometimes patients are concerned about a dry painful cough caused by involvement in the pleural process (*Troyanov's sign*); positive *sign of Kryukov*: soreness when pressing on the lower intercostal space. Characterized by an increase in the upper limit of hepatic dullness in the form of a convex arc. Positive *sign of Jaure*: the doctor's hand is applied to the area of the right hypochondrium, it perceives the shocks inflicted by the other hand in the subscapular area; at the same time the fluctuations of a liver caused by a hydraulic wave are determined. At radiography high standing of a diaphragm, restriction of its movements comes to light early enough. The presence of a gas bubble with a horizontal level below the diaphragm is an almost pathognomonic sign of a subphrenic abscess. Sometimes it is necessary to make a differential diagnosis between supra- and subphrenic abscess. For this purpose it is possible to use *Fürbringer's sign*: during breath the movements of the needle which is placed into a cavity of a subphrenic abscess are observed; if the abscess is located above the diaphragm, then these movements are absent.

**Liver and gallbladder.** Gallstone disease is a stone in the biliary system that manifests itself clinically. In the anamnesis, not all patients have a typical biliary colic, which occurs in the upper abdomen on the right or in the middle and radiates to the right upper arm. Gallstones can cause atypical pain: dull, heaviness in the underlying area, bitterness in the mouth, nausea. S.P. Botkin described the clinical picture of angina pectoris (*cholecystocoronary Botkin sign*). Information

about a previous single or recurrent jaundice is important for the diagnosis. It is rare to be able to palpate a tense gallbladder due to the obstruction of the gallbladder duct. More often the gallbladder is shrunken by the inflammatory process and is not palpable. At palpation it is sometimes possible to provoke pain

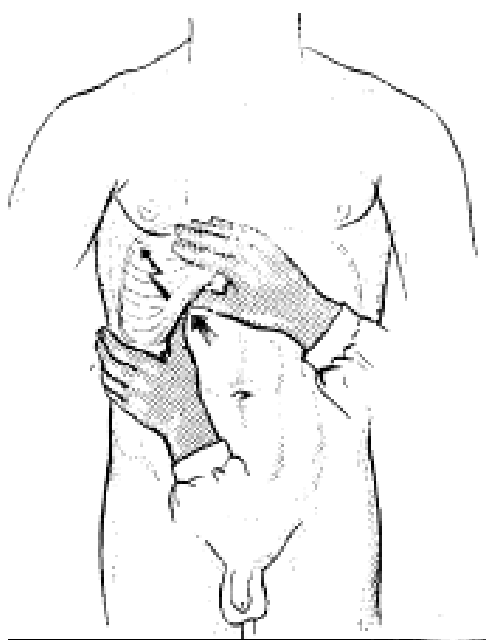


Fig.154. **Murphy's sign:**  
Gallbladder disease causes pain  
and palpation in the hypochondrium.

by **Murphy's sign**: with both first fingers gradually press under the right costal arch at inhalation sometimes there is a pain (Fig. 154). The sign is considered positive if the pain coincides by type with independent pain, which is noticed in case of the gallbladder disease. The classic description of **Murphy's sign** is as follows: evenly pressing the thumb on the area of the gallbladder, the patient is asked to take a deep breath; at the same time he/she "captures" the breath and there is considerable pain in this area. A similar sign is **Kehr's sign**: pain when inhaling in case of palpation of the right hypochondrium. The sign of the disease of liver

and biliary tract is **Ortner-Grekov sign**: patting the edge of the palm on the right costal arch causes pain. In gallstone disease, a slight increase in the gallbladder is accompanied by palpation of the lobe of the liver above the bladder; it can be mistaken for a gallbladder (**Riedel's sign**).

**Acute cholecystitis.** A history of gallstone disease makes diagnosis easy. In the first place there is pain in the right hypochondrium. It is dull and constant, radiating to the left in the mesogastric and right in the lower abdomen, rarely in the back as long as it is visceral in nature. Somatic pain becomes sharp and clearly localized in the right hypochondrium. In the right hypochondrium there is a muscle tension and a **sign of Shchetkin-Blumberg**. Septic fever and an increase in local peritonitis indicate the development of complications, empyema of the gallbladder (abscess is limited by the walls of the gallbladder). On palpation, the



gallbladder is hard, sharply limited with a smooth surface protruding beyond the edge of the liver. It is extremely painful, unlike gallbladder hydrocephalus.

**Pancreas.** In case of pancreatitis there are two forms - acute reversible (acute and acute recurrent pancreatitis) and chronic - progressive (chronic and chronic recurrent pancreatitis). If after the abatement of the acute form the function of the gland is completely normalized, then in the chronically progressive form the function of the gland gradually deteriorates until it is completely turned off. Their genesis is also diverse. Acute pancreatitis is caused by diseases of the biliary system, and chronically progressive - chronic alcoholism or vascular disorders.

There are often three stages in the development of acute pancreatitis:

1. Attack of extremely sharp, excruciating pain in the epigastrium with irradiation in the back and waist: the stage of shock - collapse.
2. Dynamic intestinal obstruction.
3. Peritonitis.

Pain in acute pancreatitis is mainly somatic in nature and is localized in the epigastrium, in the area of the pancreas, sometimes encircling and often radiating to the left costo-vertebral angle (*Mayo-Robson sign*). Against the background of pain there is profuse sweating, drop in blood pressure, cold extremities, cyanosis. Cyanosis may be general, on the face (*Mondor's sign*) or limited to the abdominal wall. Sometimes cyanosis in the form of individual blue-gray spots can be located on the anterior abdominal wall (*Hallstatt's sign*) or on the lateral walls of the abdomen (*Gray-Turner's sign*), or near the navel - "umbilical ecchymoses" (*Grunwald's sign*).

Simultaneously with the pain comes repeated painful vomiting, sometimes with a mixture of bile or blood. The abdomen is swollen, mainly in the upper part. In some cases, there is a *sign of Kerte*: transverse painful resistance, which topographically corresponds to the location of the pancreas. *Voskresensky's sign* is caused by consolidation of a pancreas covering an aorta and hiding its pulsation. The differential diagnosis of myocardial infarction and acute pancreatitis is

**Janelidze's sign**: reduction of pain on deep palpation of the epigastric region is characteristic of heart attack, and increased pain – for pancreatitis. **Chukhrienko's sign** also speaks for acute pancreatitis: the pain arising at push-like pressure on an abdominal wall, making from below upwards and in front back a palm located across a stomach below and a little to the left of a navel.

Of the tumors, the most common is cancer of the head of pancreas, which is manifested by increasing jaundice and greatly enlarged gallbladder of rigid elastic consistency, painless (**Courvoisier's sign**).

**Acute intestinal obstruction** can be mechanical (strangulation: with circulatory disorders in the mesentery of the affected part of the intestine; obstructive: only the intestinal lumen is blocked) and dynamic (paralytic and spastic). High strangulation obstruction is the most severe. Pain, nausea, vomiting, delayed stool and gas come to the fore.

With high intestinal obstruction, the last two symptoms may be absent. With small intestinal obstruction, a typical visceral pain of a convulsive nature, which occurs

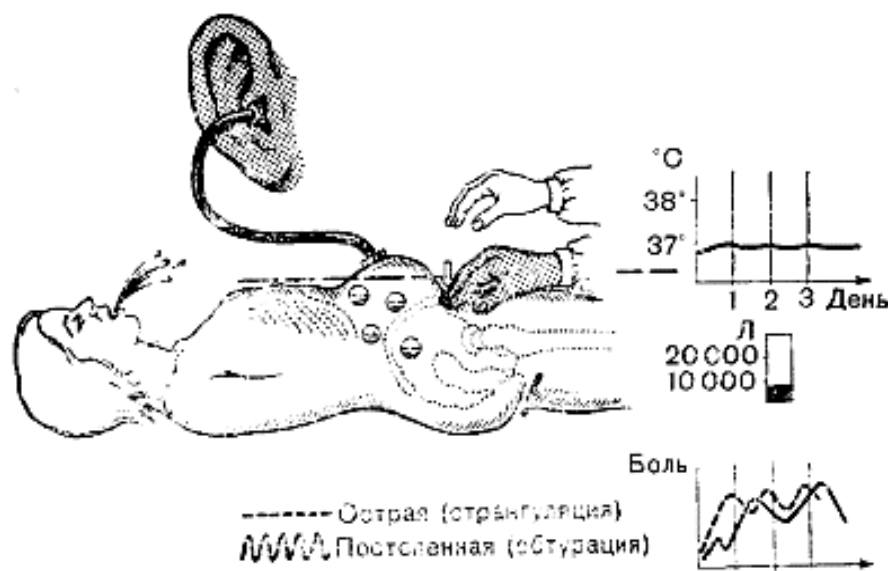


Fig.155. **Mechanical intestinal obstruction.**

Cramp-like visceral pain, acute with strangulation and gradual with obstruction. Stool and gas delay. Reflex vomiting in the early period during strangulation, in the late period - during obstruction only with increasing intestinal distension. The abdomen is bloated but soft. Ringing intestinal murmurs. The temperature is not elevated, there is no leukocytosis.

periodically and at its highest point resembling labor contractions (Fig. 155). Painless intervals with high intestinal obstruction are 3-5 minutes, and at low 6-10 minutes. With colonic obstruction, the pain is lingering and less intense. At

strangulation intestinal impassability pain arises sharply and is of a constant type. Periodically weakening a little, at obturations - pain has a convulsive character, growing. In between, the pain may subside completely, with partial obstructive obstruction, the pain is accompanied by a loud, audible roar.

Abdominal examinations begin with an examination. The abdomen should be exposed from the nipples to the middle third of the thighs, first of all it is necessary to examine the groin and femoral canals. Asymmetry, skew (oblique abdomen) is often observed in torsion of the sigmoid colon. An early sign of intestinal obstruction is a clearly demarcated distended intestinal loop with a zone of high tympanitis above it - a *sign of Vahl*. An important feature is the visible peristalsis of the intestines, which is detected independently or after a light tap of the abdominal wall in the form of a growing shaft in a certain place. More often this symptom happens at obstructive intestinal impassability. The abdominal wall at first the disease is soft, painless, to the development of peritonitis.

Of great diagnostic value is the "slap noise" (*Sklyarov's sign*), which occurs when the abdominal wall is shaken or when the patient is rocking and is due to the presence of one or more loops of the intestine, full of fluid and gases. At strangulation impassability it can appear in 2-3 hours from the beginning of a disease. Its diagnostic value decreases after a recently placed enema. With percussion of the abdomen and simultaneous auscultation, it is possible to hear sometimes a sound with a clear metallic hue - a *sign of Kivul*, caused by a sharp bloating of the intestine, which is more common in sigmoid torsion. At auscultation at first the strengthened intestinal noises are heard – then gurgling, then grunting or roaring. As the paralysis progresses, the intestinal murmurs weaken and the sound of a falling drop appears (*Spasokukotsky's sign*). Then comes paralysis of the intestine: when listening to the abdomen there is complete silence (*sign of Hose*). At a torsion of a sigmoid gut, quite often there is a positive *sign of Obukhov hospital (Grekov's sign)*: the expanded empty ampoule of a rectum at rectal research is expanded.

At impassability of a large intestine the expressed local flatulence in the field of a caecum (a *sign of Anschutz, Bouver*) is sometimes observed. At a review roentgenography of abdominal organs at heavy forms of impassability there are in 2-3 hours Kloyber's bowls: horizontal levels of liquid and gas bubbles over them.

Intra-abdominal bleeding is most common after a blunt trauma to the abdomen with rupture of the spleen, as well as in ectopic pregnancy complicated by rupture of the fallopian tube. Symptoms are general (weakness, dizziness, pallor), and local: the appearance of protrusions in the swollen abdomen (frog abdomen), if the abdominal cavity collects 1 liter or more of blood, it is determined by blunting. Fluid in the abdomen (blood, ascites) can be determined by the method of undulation: apply the left palm to the site of the explosion, on the opposite side with the other hand to strike lightly. In the presence of fluid in the abdomen, this shock is felt with the other hand. When the spleen is damaged, patients often rush to lie on the left side, when the liver is damaged - on the right. Patients are reluctant to change this position, because its change causes increased pain (*Vanka's sign*). When the liver is damaged, patients complain of dull pain in the right hypochondrium, when the spleen is damaged - in the left. Pain radiates when the liver is damaged in the right upper arm, when the spleen is damaged - in the left upper arm. Possible sign of splenic rupture: percussion tympanitis on the right side of the patient's abdomen, lying on the left side (*Belens's sign*). In the

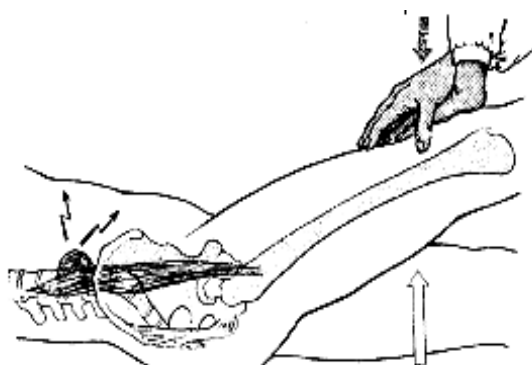


Fig.156. Lumbar muscle pain is a Psoas sign.

presence of blood in the abdomen, there is usually a positive *sign of Kulenkamp*: percussion on the soft or almost soft abdominal wall causes severe pain.

**Renal damage** is accompanied by a more or less pronounced extraperitoneal hematoma, which can be felt in the form of a non-pulsating formation in the costal-vertebral region and extra-abdominal space during bimanual examination. Irritation of

the posterior parietal peritoneum in the lumbar muscle gives a *Psoas sign*: pain in lower area on the right along the lumbar line, caused by the contraction of the lumbar muscle, which occurs when trying to lift an outstretched leg with the opposition of a doctor (Fig. 156). Sometimes the patient can not stretch the leg at all, especially in the hip joint. If the mobile organ of an abdominal cavity (mobile departments of a gut, a mesentery) is inflamed, pain amplifies at a stomach concussion (fig. 157).

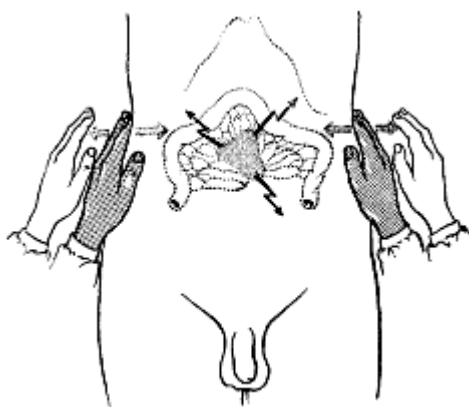


Fig.157. Pain from epigastric rere eeepigastricconcuSSION.

**Widespread peritonitis** is the most serious disease. Subjectively, somatic pain comes to everywhere. On common examination, it has been severe general condition. On palpation, the abdomen is tense, painful, positive signs of peritoneal irritation. Peritonitis lead to paralytic intestinal obstruction. At auscultation there are no intestinal noises. Mostly the cause of diffuse peritonitis is acute appendicitis (70%) (Fig. 158).

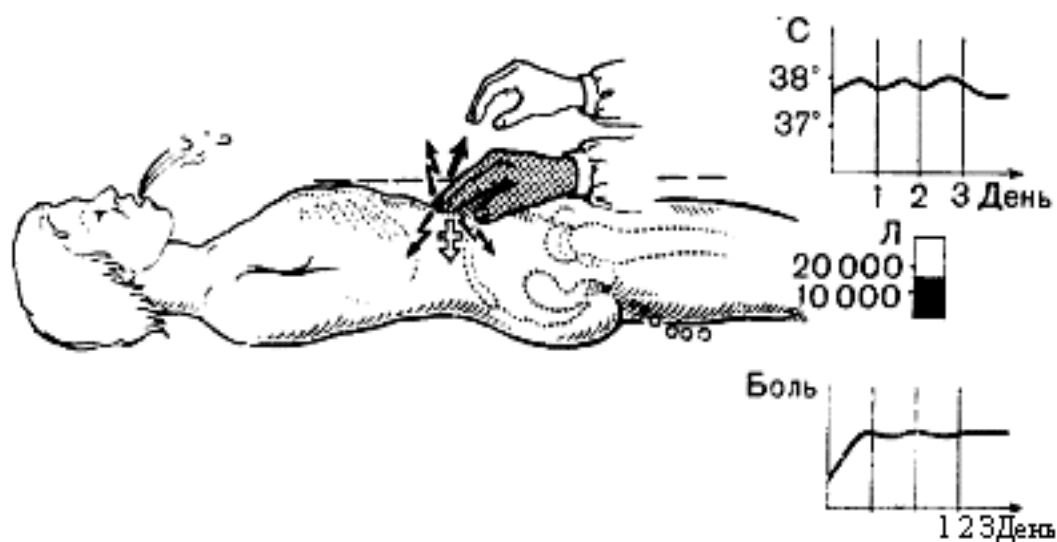


Fig.158. **Widespread peritonitis.** Constant somatic pain. At an early stage there is a discharge of gases and stools, later they are delayed and not pass out at all. Vomit. Spilled reflex protective voltage. Spilled pain on palpation, tapping and abruptly removal of the hand. Lack of peristalsis in the late stage. Constantly high body temperature. Moderate or severeleukocytosis.

### Abdominal wall.

Diastasis of the rectus abdominis - a wide and weak white line of the abdomen with poorly developed rectus muscles may bulge with increasing intra-abdominal pressure, for example, lying down when lifting straight legs or head. There is no hernia gate.

Abdominal wall hernia. The most common hernia is the umbilical cord. It comes out while standing, and in a supine position exercises in the abdomen. Hernia of the white line of the abdomen occurs above the navel. At a palpation it is possible to correct contents of a hernia bag and to feel a hernia gate with a tip of an index finger (fig. 159 a, b).

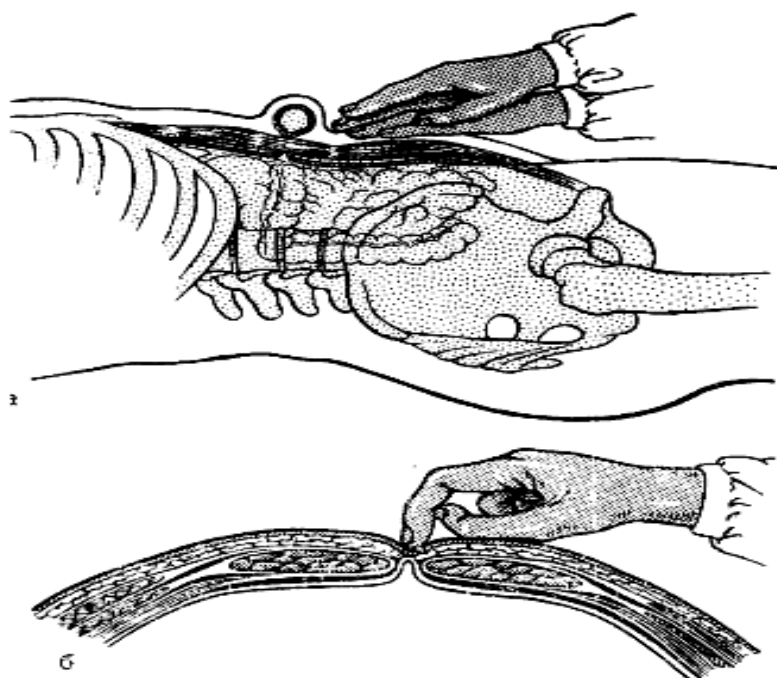


Fig.159. **Palpation of the abdominal wall hernia:**  
a - at the left hernia; b - hernia gate at the fixed hernia.

If the hernia is not irreducible, it will not be possible to feel the hernia gate. When the hernia is strangulated, it is very painful, the skin over it is hyperemic, when the loop of the intestine is pinched, the symptoms of acute intestinal obstruction are revealed.

**Inguinal area.** The examination begins with an examination in comparison with the opposite side (Fig. 158). The examination is performed in the position of

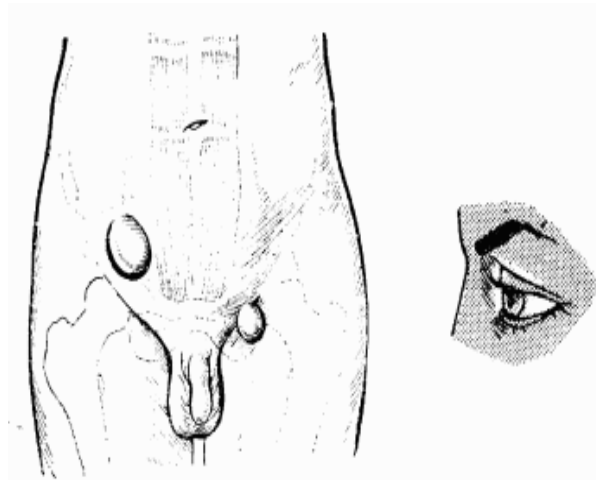


Fig.160. **Comparative examination of the hernia in the iliac region.** Right: hernia above the pupal ligament - inguinal hernia; on the left - below the pupar ligament - femoral hernia.

the patient both lying down and standing, while the patient is asked to cough (Fig. 159). In men, the

apical rings are defined by the tip of the index finger together with the sufficiently mobile skin of the scrotum (Fig. 160). With the right technique, you can push your finger to the inner ring of the inguinal canal. Sometimes with a bent finger, you can determine the pulsation of

the inferior epigastric artery, which is important to establish the nature of the

hernia. Depending on the position of the hernia gate, there are straight and oblique inguinal hernia (Fig. 161). At a palpation, the existence of a hernia can be confirmed by a cough push: at cough the hernia bag strikes the finger entered into the inguinal channel. When intestinal loops are kept in a hernia bag – it is possible to listen to intestinal noises (fig. 162). If an inguinal hernia descends into the scrotum, it is called an inguinal hernia. Difficulties of differential diagnosis arise in the case when at the same time there is a water of a testicle

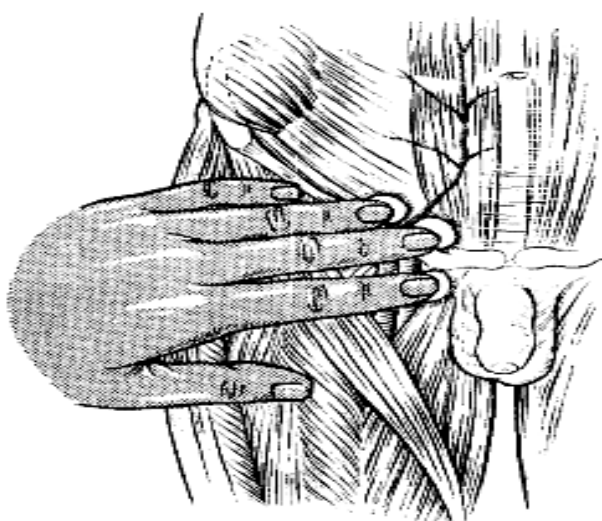


Fig.161. **Identification of the hernia gate with three fingers:** the ring finger is located above the inner opening of the inguinal canal (outside the epigastric artery - oblique hernia), the middle finger on the lower wall of the inguinal canal (inside the epigastric artery - straight hernia) vessels (below the pupar ligament - femoral hernia).

cover. In such patients, diaphanoscopy is positive over water and negative over hernia. Each hernia is checked for irreducibility. (Fig. 163).

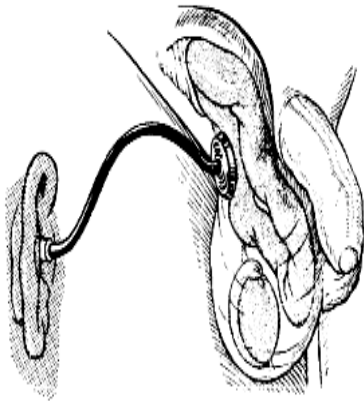


Fig.162. **Inguinal-scrotum hernia.**  
If the hernia sac holds the loop of the intestine, then an intestinal murmur is heard.



Fig.163. **Reduction of inguinal hernia.**

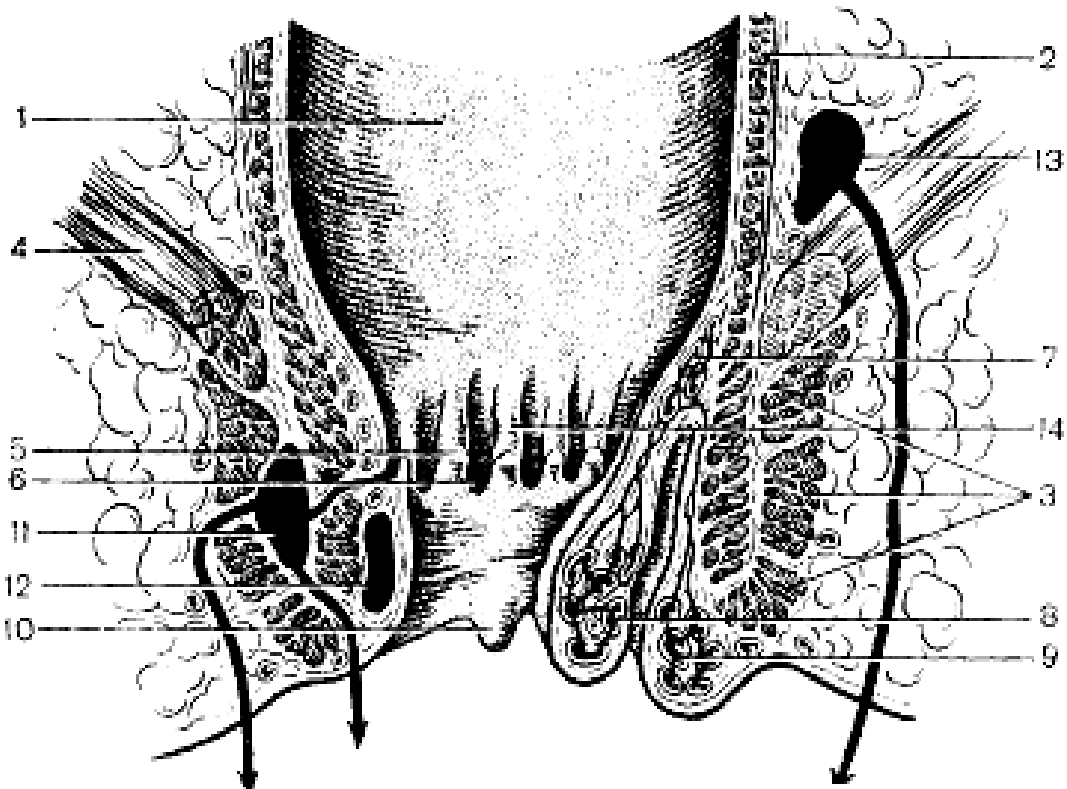


Fig.164. **Schematic section of the anus, anatomical features and typical localization of diseases.**

1- ampoule of the rectum; 2- longitudinal muscles and middle sphincter of the anus; 3- external sphincter of the anus; 4- muscles that raise the anus; 5- suckers; 6- crypts; 7- median venous plexus; 8- fallen median hemorrhoid; 9 - external venous plexus; 10 - skin risks; 11- typical location of the manure in the intermuscular septum with a fistula coming out of the crypt; 12 - slippery manure; 13 - ischiorectal manure with high fistula (rare); 14



**Femoral hernia** occurs below the umbilical cord and inward from the femoral vein. It is more common in women.

**Anus.** Anatomy and more important pathological processes are presented schematically in (Fig. 164).

Paraproctitis (Fig. 164, 165) can be big and even pass to a gate. The most significant symptoms are pain, redness of the skin and fluctuations. Because perineal tissue is inflexible, fluctuations are often absent.

**Acute crack of the anus** is a painful, sometimes bleeding, superficial rupture of the mucous membrane.

On the contrary, **a chronic crack of the anus** forms a defect, in the depth of which it is possible to distinguish the fibers of the internal compressor. For a crack of an anus the strong pain at defecation lasting about 10-20 hailin is typical. The diagnosis is made by examination. At the same time buttocks of the patient should be parted (Fig. 166). In the knee-elbow position, the crack is almost always located on the 12 o'clock digital dial. Finger rectal examination is not performed due to severe pain.

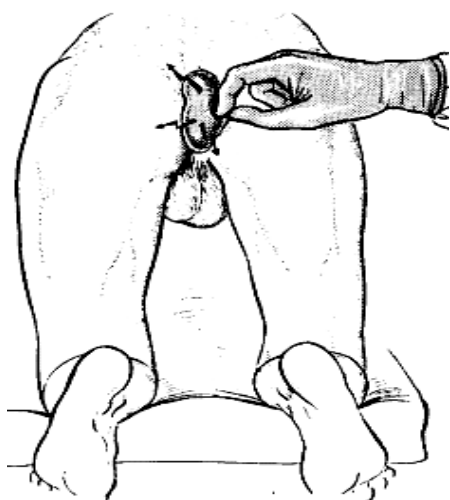


Fig.165. **Paraproctitis.** Pain, fluctuation, signs of inflammation.

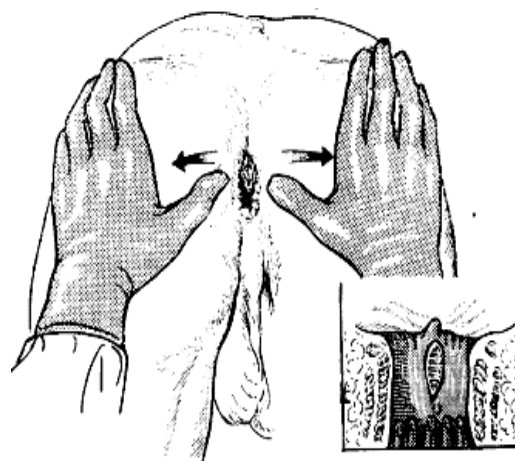


Fig.166. **Crack of the anus.** Typical localization.

**Fistulas of the anus.** At an anal fistula the rectal skin course going out of an anus is formed. Most fistulas originate from crypts.

At inspection an external opening of a fistula is determined in the form of small elevation of granulation fabric over skin with allocation of allocation. This part of the fistula is areound the anus. The course of a fistula is specified by means of a probe and at the same time rectal finger examination (Fig. 167). This study should be conducted gently, so as not to create a wrong move. A safe method is the introduction of dye into the fistula with a dense consistency (Fig. 168).

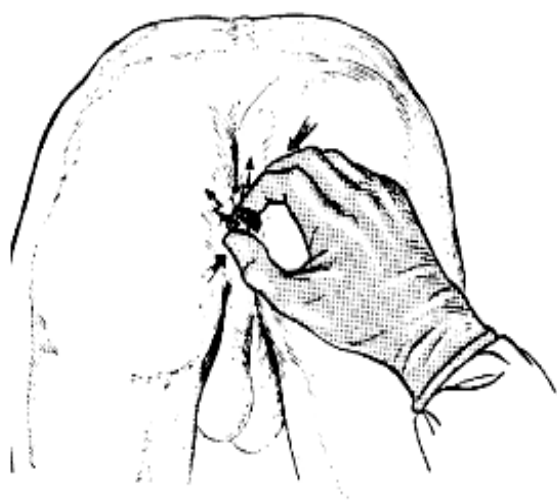


Fig.167. **The external hemorrhoidal node is thrombosed.** Spontaneous pain and soreness when pressed.



Fig.168. **The internal hemorrhoids (II and III degree).** Radially spaced furrows.

**Internal hemorrhoids.** During the examination, the fallen hemorrhoid is distinguished from the anus on the radially located grooves, cyanotic color and hilly surface. At a palpation it is possible to define a transitional mucous-skin-mucous wrinkle. It is possible to empty the soft knots carefully filled with blood (fig. 169).

**Prolapse of the anus and rectum.** At examination – considerable circular folds of a mucous membrane having a smooth surface is found (fig. 170). At full loss it will be possible to feel all layers of a rectum (fig. 171). There is almost

always incontinence. With any bleeding from rectum you have to think about rectal cancer.



Fig.169. **Examination of hemorrhoids.**  
On palpation, the consistency is soft, squeezing blood.

Epithelial and glandular polyps or villous papilloma may fall out through the anus (Fig. 172).

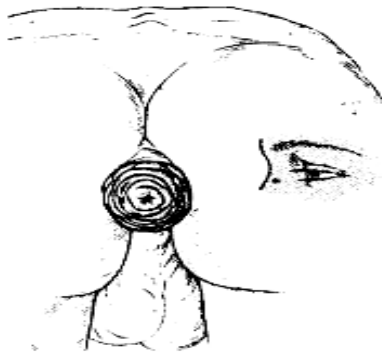


Fig.170. **Rectal prolapse.**  
Circular wrinkles of the mucous membrane.

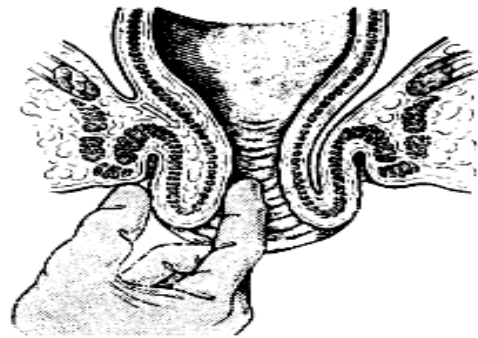


Fig.171. **Rectal prolapse.** Palpation of the invaginated wall of the rectum. Interstitial hernia due to omission of Douglas space.

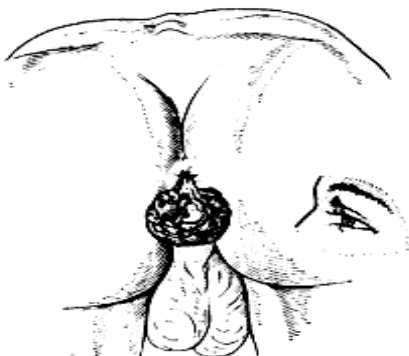


Fig.172. **Loss of malignant or benign tumor of the rectum** with the expression of its surface.

## Urological examination

**Kidneys.** Palpation of kidneys should be done with both hands. In a patient lying on his/her back, with the hand behind, just below the costal arch, the kidney is pushed towards the hand, which makes a deep palpation of the abdomen. You can normally feel only the lower pole of the kidney. The right kidney is normally lower than the left one. Hypernephroid cancer in most cases is localized in the upper pole of the kidney, it can not be felt in the initial stage. Macrohematuria is an important symptom.

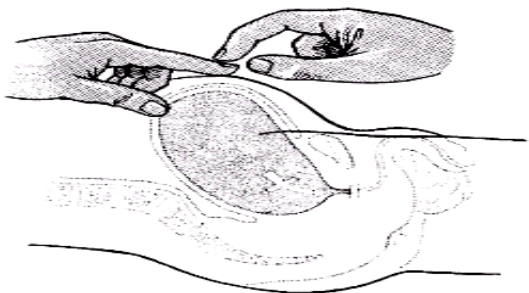


Fig. 173. **Acute urinary retention.** Diagnosis and detection of the boundaries of the filled bladder by percussion.

### Bladder

It can be palpated only when it contains at least 1500 ml of urine. If at percussion the full bladder is defined or it is defined even after urination, then there is a delay of urine (Fig.173). Acute urinary retention is most often caused prostate adenoma, urethral stricture and anterior prostate cancer in men, uterine fibroids, cervical cancer (Fig. 174 a-c) and trauma in women.

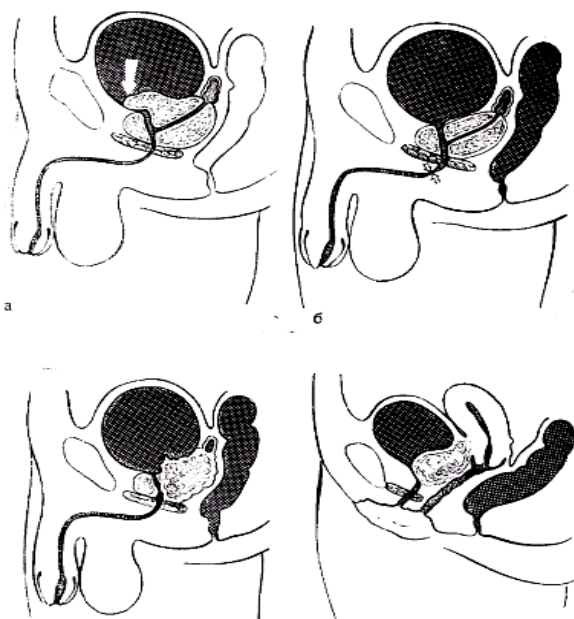


Fig.174. **The most common causes of urinary retention:** a- b-c- in men, d- in women. a- prostate adenoma; b- narrowing of the urethra; c - prostate cancer; d - uterine fibroids or cervical cancer.

**Bladder injury** can be intra-ectopic ectopic. Extruterine ruptures are difficult to recognize. They are often associated with fracture of the bones of

the cape with a shift. Patients complain of urge to urinate, hematuria. Mid-abdominal ruptures of the bladder are more easily recognized due to the peritonitis

that develops. *Zeldovich's sign* can serve as a sign of a rupture of a bladder: through the catheter entered into a bladder the liquid which exceeds quantity of capacity of a bladder is allocated. The final diagnosis is established by cystography: after the introduction of X-ray contrast agent through the catheter, the contours of the bladder are blurred by the filled bladder by percussion.

**Penis.** The most common malformation is hypospadias, which is expressed in the incomplete formation of the urethra. The mouth of the urethra is located on the lower surface of the penis, in extreme cases at the root of the scrotum (Fig. 175), accompanying in the form of a rolled up sleeve.

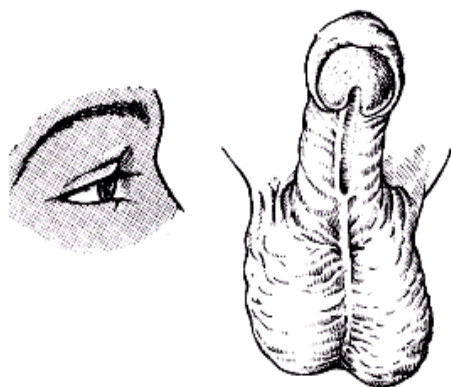


Fig.175. Hypospadias.

The penis is strongly curved. Less common is *epispadias* with an opening of the urethra on the back of the penis. An examination of the wrapped trachea is performed. If it is impossible to wrap it, then there is a *phimosis* (Fig. 176). If the appendix does not shift inverted (not refueled) and a compression ring is formed behind the head, then there is *paraphimosis* (Fig. 177).

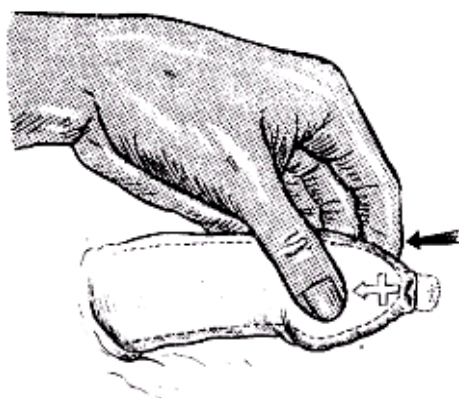


Fig.176. **Phimosis.** It is not possible to move the trachea behind the head of the penis.

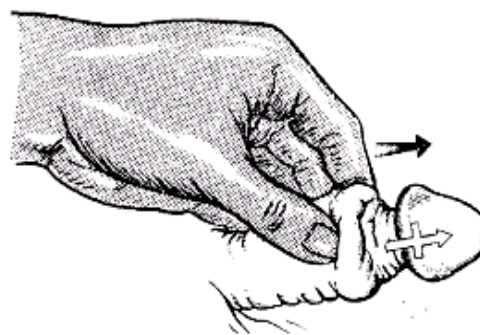


Fig.177. **Paraphimosis.** A sclerosing ring is formed in the furrow, which prevents the head of the penis from being inserted. Edema and venous stasis of the head.

**Scrotum and ejaculatory cord.** Examination of the ejaculatory cord is performed by palpation with two fingers (Fig. 178). At hydrocephalus of a spermatic cord the smooth, delimited formation is palpated above and below (fig. 179). Dilation and varicose veins of the spermatic cord is called varicocele. Noticeable convoluted and varicose veins on the scrotum, often on the left (Fig. 180).

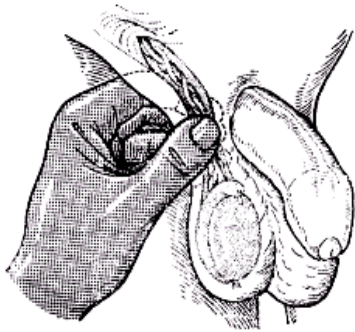


Fig.178. **Palpation of the spermatic cord with two fingers.**

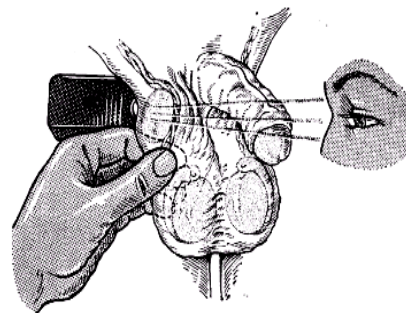


Fig.179. Cyst of the spermatic cord. Separation from testicles. Positive diaphanoscopy

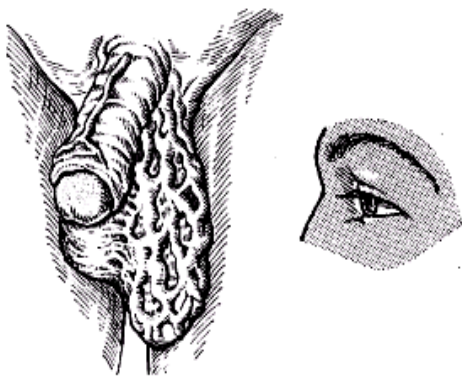


Fig.180. Varicose veins of the ejaculatory cord. On the scrotum free and varicose veins, often on the left, the left half of the scrotum is located below.

**Acute epididymitis** is extremely painful, swelling of the scrotum (Fig. 181). Pain in the ejaculatory cord and testicles. In the early stage, the appendix is separated from the testicle, and in the late stage is not. Raising the scrotum to the womb relieves pain. Difficulty in the outflow of sperm from the appendix of the testicle can lead to the formation of cysts, spermatocele, containing seminal fluid:

tight, elastic, often rounded formation with a smooth surface. Diaphanoscopy of the scrotum is positive (Fig. 182).

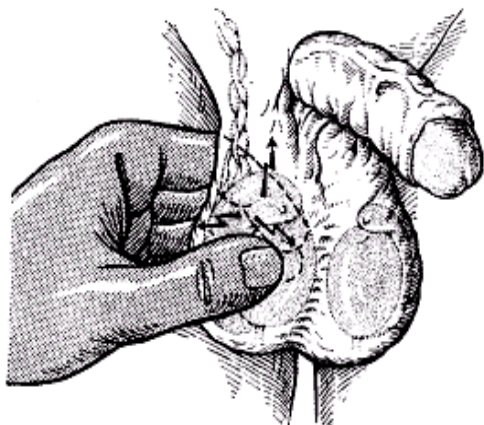


Fig.181. **Acute epididymitis.**

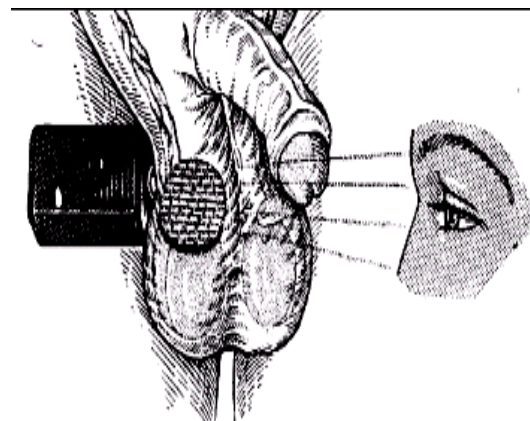


Fig.182. **Spermatocele.**  
Diaphanoscopy is positive.

A comparative examination of a standing patient makes possible to determine the position and size of the testicles. The left testicle is normally located below the right due to poorer venous outflow. Palpation of the testicle is performed bimanually (Fig. 183). At a palpation with one hand it is possible not to define absence of a testicle and to palpate existing only owing to its mobility in a gate (fig. 183). An atrophied testicle is soft, smaller, and sometimes more painful than

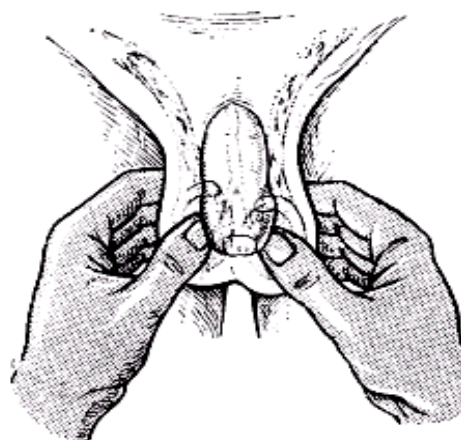


Fig.183. **Bimanual palpation of the testicles.**

normal. Testicular torsion occurs suddenly and is accompanied by sharp pain. It is more common in childhood or adolescence, because the testicle is not yet sufficiently fixed in the scrotum (Fig. 184). If under a painful, hyperemic swelling of scrotum the painful and enlarged testicle is defined, it is an *orchitis* (fig. 185).

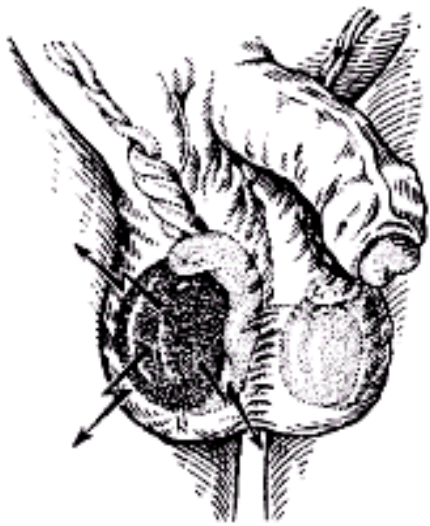


Fig.184. Testicular torsion.

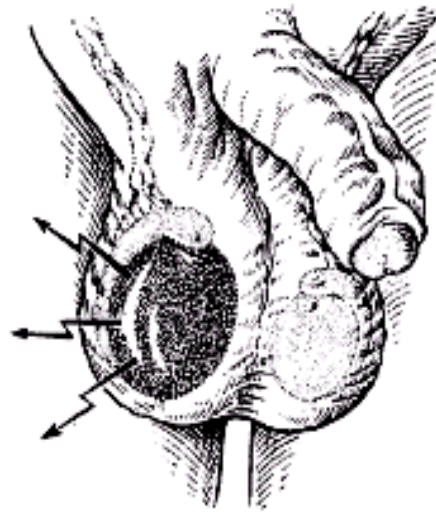


Fig.185. Orchitis.

If a painful and tight elastic formation is palpated, which cannot be separated from the testicle and appendix, diaphanoscopy gives positive results, it is hydrocephalus of the testicles (*hydrocele*).

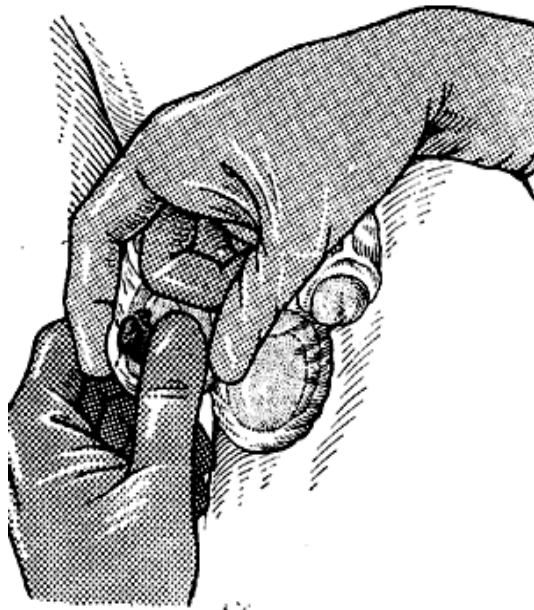


Fig.186. Testicular tumor

Testicular tumors do not usually cause pain, but sensitivity in this area is reduced. Smooth, painless and enlarged. Sometimes only testicular enlargement, symptomatic hydrocephalus or chronic inflammation of the appendix (Fig. 186).

**The prostate** is examined by rectal palpation (Fig.187). It is indicated for dysuric disorders, discharge from the urethra, dull pain in the perineum.

Examination of the normal prostate is unpleasant, causes the urge to urinate, but is not accompanied by pain. Poor restriction from surrounding tissues or limited mobility of the rectal mucosa indicates the spread of the disease beyond the gland capsule. The normal prostate is 2 - 2.5 cm long and 3 cm wide. Its consistency resembles rubber. The two lateral lobes are separated in



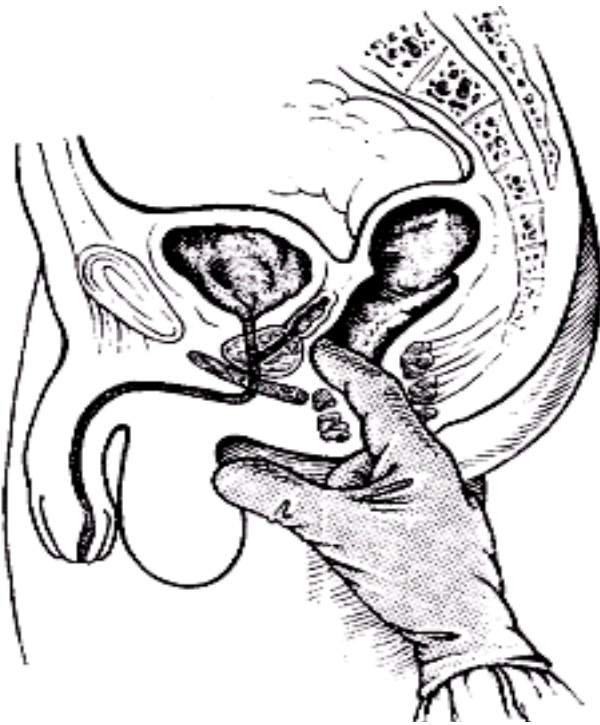


Fig.187. Examination of the normal prostate through the rectum.

the middle by a groove. With hyperplasia or inflammatory edema, this groove disappears. The seminal vesicles are located above and on the sides. Normal seminal vesicles are not palpable.

Acute prostatitis causes dull pain in the perineum and dysuric phenomena. At a palpation of a prostate there is a soreness, the diffuse hypostasis and smoothness of contours (fig. 188). In chronic prostatitis is uncertain pain in the small cape, rectum and anus with irradiation to the testicles, groin area and back. Palpation is sometimes

accompanied by pain, but more often shows only a compacted and raised cell (Fig. 189).

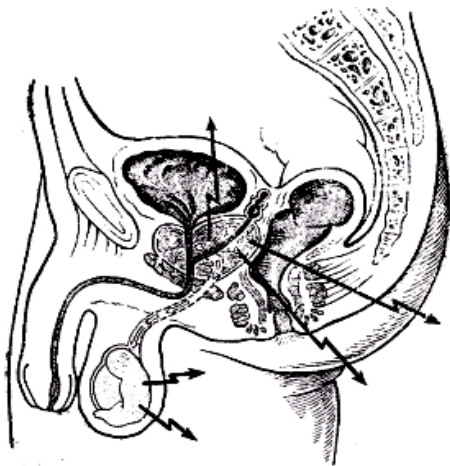


Fig. 188. Acute prostatitis. Dull pain in the perineum. Sometimes simultaneously epididymitis due to an upward infection.

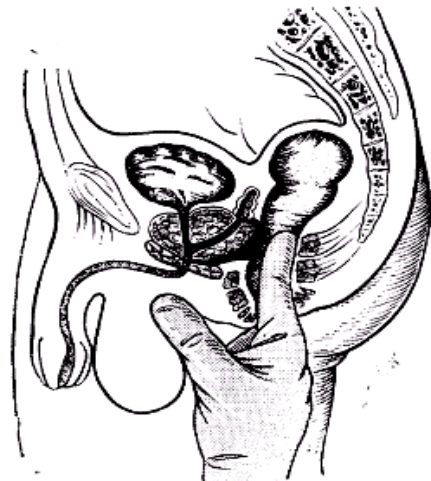


Fig. 189. Chronic prostatitis. Increased dense focus during rectal examination.

Differential diagnosis of early cancer can be difficult. The diagnosis is made on a 3-glass sample (the last portion after prostate massage), when in the third glass are leukocytes and / or bacteria (Trichomonas).

***Hyperplasia (adenoma) of the prostate gland*** is an adenomatous growth within the capsule. Normal prostate tissue is pushed to the periphery. It is divided into three stages: ***Stage 1***: initial urinary retention before urination, weakening of the urinary flow, dysuria, nocturnal urges and nocturia (nocturnal pollacturia). There is no residual urine. ***Stage 2***: residual urine from 50 to 150 ml. ***Stage 3***: There is stasis in the upper urinary tract and often signs of uremia. Residual urine more than 150 ml. Palpation reveals an enlarged and hilly formation with clear contours and a smoothed furrow (Figs. 190, 191). The examination is painless.

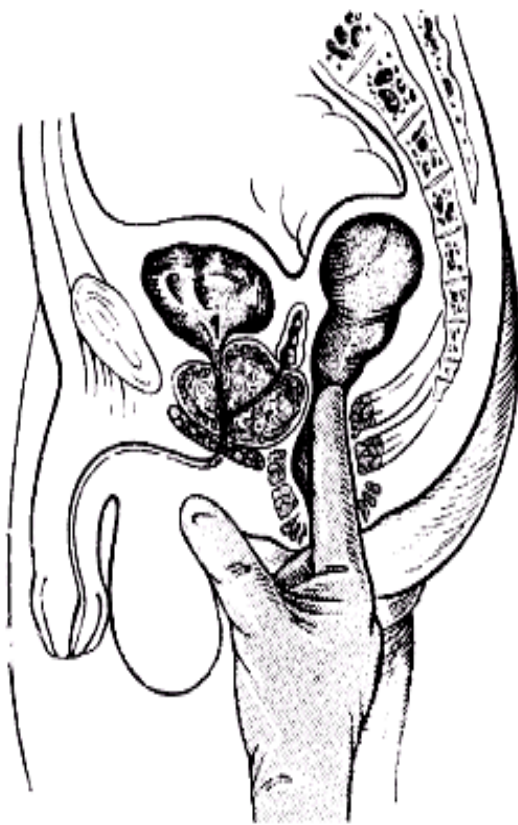


Fig.190. **Prostate hyperplasia**  
(adenoma).

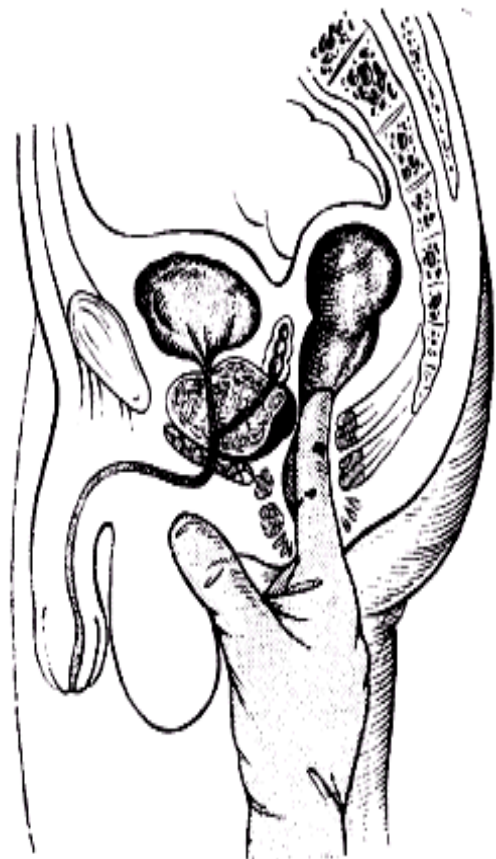


Fig. 191. **Prostate cancer.**

### Gynecological examination.

Every surgeon must have the technique of at least a cursory gynecological examination. By examination in the position of the patient

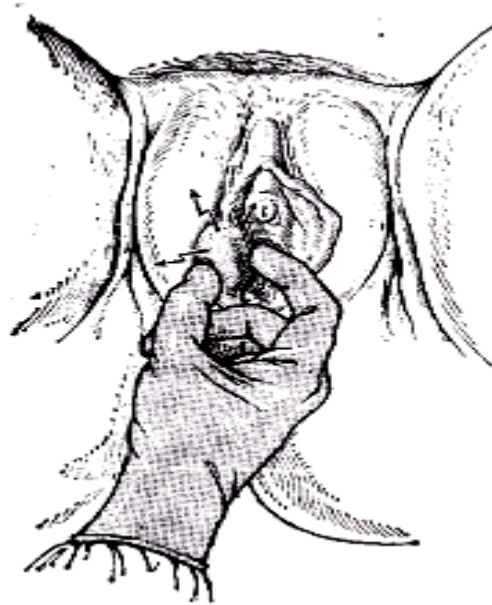


Fig. 192. **Bartolinite.** Painful, hyperemic in the late stage fluctuating swelling in the posterior third of the labia minora.

it will be able to diagnose external damage. Constant burning pain can be caused by *bartholinitis* - painful, very noticeable swelling and redness in the lower third of the labia minora (Fig. 192).



Fig. 193. **Omission of the vagina with cystocele and rectocele during straining.** Examination after spreading the labia.

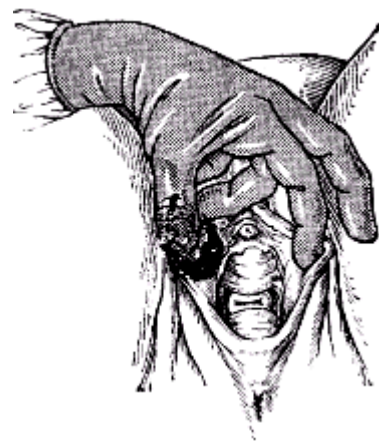


Fig. 194. **Partial prolapse of the uterus.** Examination after spreading the labia.

If you spread the labia with the first and second fingers of the left hand and ask the patient to strain, you can see the lowering of the vagina (Fig. 192), partial or complete uterine prolapse (Fig. 193, 194). Simultaneous eruption of the vagina in front indicates a cystocele. It can cause persistent cystitis, residual urine and incontinence. A similar explosion behind occurs with rectocele. It causes indefinite pain during defecation.

Bimanual palpation is performed with the help of the index finger inserted into the vagina, and with a sufficiently wide vagina - the index and middle fingers; the other hand is placed on the patient's abdomen over the pubis. As the "inner" hand moves to the "outer" hand, the "outer" hand can determine the size, shape and consistency of the nut (Fig. 195). The study should be done ultimately after emptying the bladder. Sliding movements of both hands on the sides of the uterus can get an idea of the appendages of the uterus (Fig. 196).

Normal fallopian tubes are not palpable. However, if they are thickened and painful and at the same time have inflammatory symptoms, it has been pointing on

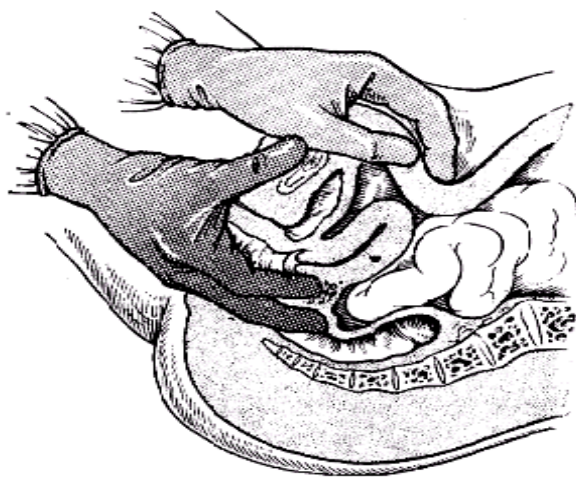


Fig. 196. Rectal-vaginal palpation



Fig. 195. Complete prolapse of the uterus with inversion of the vagina.

acute adnexitis. If there are no general symptoms of inflammation, it is chronic inflammatory process, hydrosalpinx or ectopic pregnancy.

Acute adnexitis may be difficult to diagnose with acute appendicitis. At an adnexitis the general inflammatory phenomena are more expressed, the

greatest pain will be directly over a pubis,

instead of strictly laterally. In most patients, except for very full, with adnexitis it is possible to feel the ovary in the form of a solid, 2-3x2 cm, slightly painful formation. Tight elastic increase allows to suspect ovarian cysts. Torsion of the ovarian cyst is one of the most common causes of acute abdomen in women. Sudden pain in the lower abdomen, cramping and without clear localization due to visceral nature. If the symptoms occur during sexual intercourse, the diagnosis is confirmed. Bimanual palpation is almost impossible due to pain.

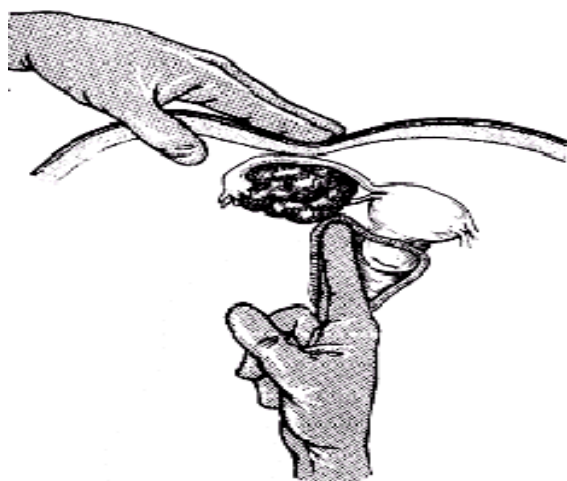


Fig. 197. **Bimanual palpation of the uterine appendages**

Injury of tubal pregnancy causes massive intra-abdominal bleeding connected with tube rupture. In doubtful cases, the diagnosis is confirmed by severe pain when moving the cervix (ventral lift of the cervix from the posterior arch), exploding painful Douglas space.

### **Examination of patients with emergencies**

The diagnosis should be made quickly, and in a threatening condition emergency care should be provided. Injuries Violations of vital functions should be recognized and eliminated urgently. Here, recognition and treatment of symptoms precedes diagnosis. If vital functions are preserved, then through a targeted examination, the doctor must identify a threatening injury or illness and immediately address the issue of urgent surgery for vital signs. If there are also indications for surgery, it is impossible to waste time on further clarification of the diagnosis. In order not to miss the main thing and reach the goal as soon as possible, it is best to follow the scheme presented in Fig. 198, and examine the three systems responsible for vital functions (Fig. 199).

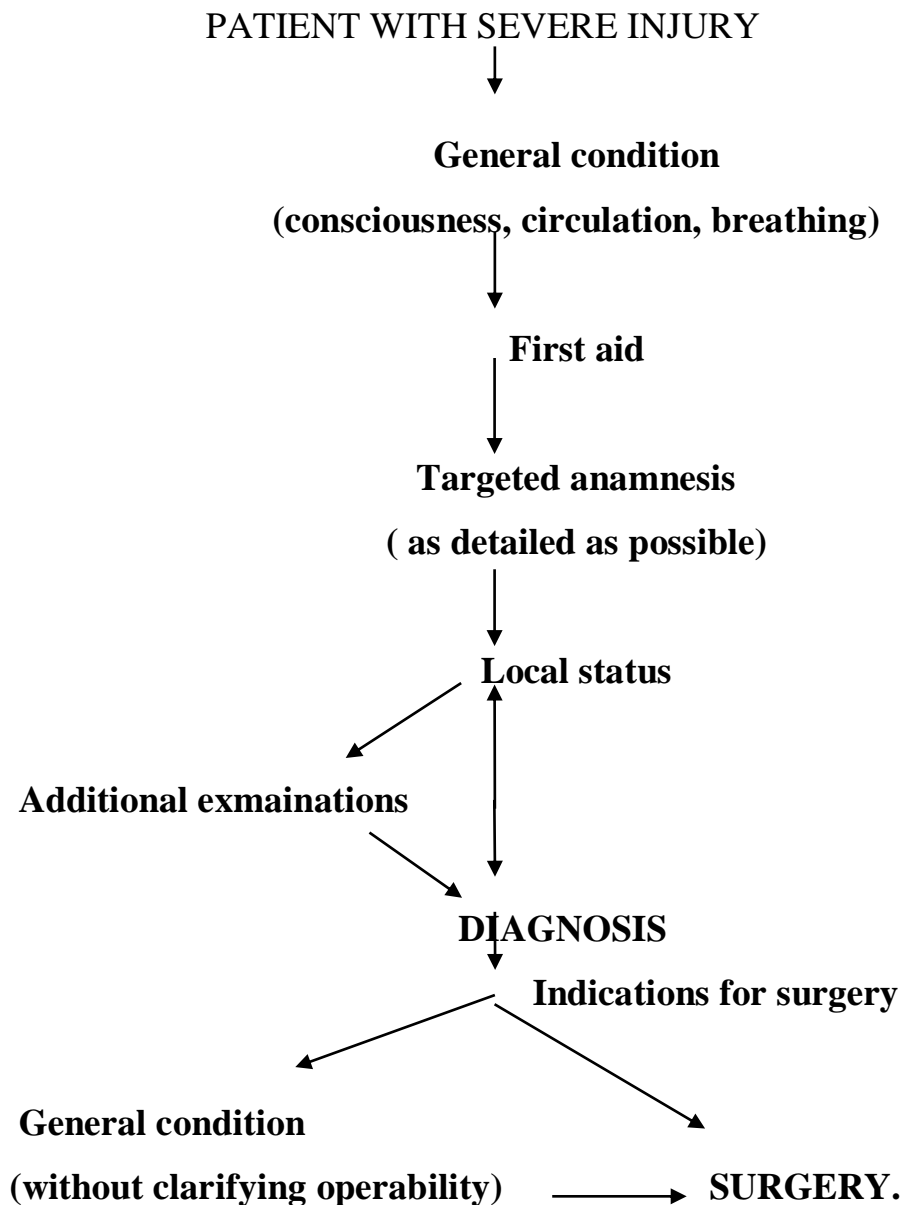


Fig. 198. The course of the examination  
in case of severe injury.

**Clarifying examination:** central nervous system; respiratory system; circulatory system. All these systems are interconnected. Therefore, their functional capacity and disorder should be assessed in a complex and eliminated at the same time: for example, a brain injury can lead to cessation of breathing and blood circulation. On the contrary, a patient with bleeding may faint; difficulty breathing due to the accumulation of carbon dioxide leads first to loss of consciousness and then to cessation of blood circulation. Respiration and blood

circulation both closely link primarily, so the restoration of hemodynamics without the provision of artificial respiration does not lead to sustainable success.

The degree of disturbance of consciousness is established immediately. It affects treatment and prognosis.

**Mild disorder** of consciousness: the patient confuses questions; disoriented in time, place or in relation to himself; sometimes drowsy, but easily awakened; he performs such commands as: "Open your eyes, show your tongue!"; involuntary reflexes are preserved (for example, cough reflex).

**Moderate disorder:** the patient is in a sopor, he/she will not be able to wake up, he/she does not follow commands. To such painful stimuli as a pinch or a prick, it responds by removing a knife or a protective movement. There is a danger of aspiration.

**Severe disorder** of consciousness: the patient falls into a coma and is not contact. There is no protective reaction to painful stimuli. Pupils respond to light.

Spontaneous transition from mild to severe disturbance of consciousness is possible.

### **Death:**

- wide pupils that do not respond to light; complete areflexia;
- no reactions to stimuli;
- lack of independent breathing of the central nervous system regulated movements of the eyes, face, palate, pharynx, torso and limbs;
- rapid drop in blood pressure without artificial measures to support hemodynamics.

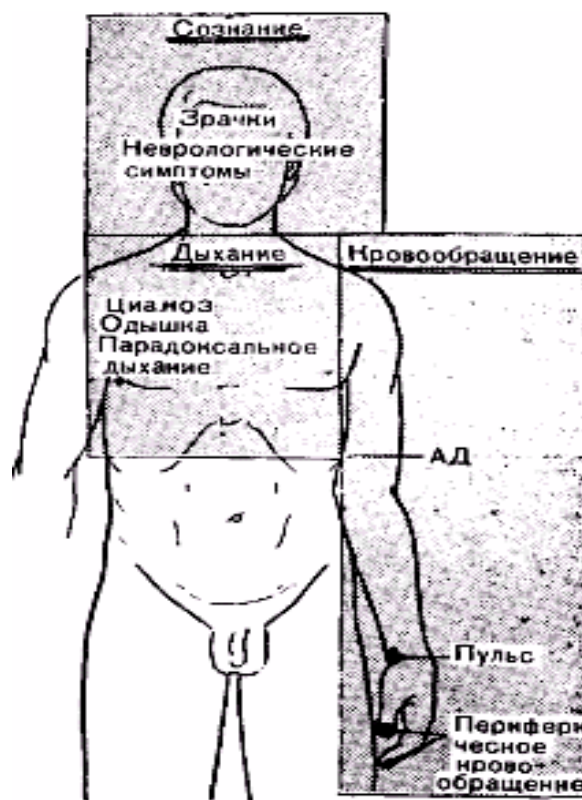


Fig. 199. Examination of urgent patient with severe injury: three vital functions.

Respiratory and circulatory disorders that accompany disorders of consciousness must be quickly recognized and eliminated before irreversible changes in the brain have occurred.

If the loss of consciousness is not caused by trauma or surgical disease, it is necessary to keep in mind other reasons (they are arranged in order of frequency):

- hemorrhage, ruptures of intracranial aneurysms; intoxication (alcohol, medication); meningitis;
- metabolic disorders (diabetic and hypoglycemic coma, hepatic coma, uremia);
- heart disease (especially Adams-Stokes blockade);
- hypocalcemia (hyperventilation, pancreatitis).

Respiratory disorder is expressed in tachypnea with increased respiratory muscle function, tachycardia and cyanosis.

In severe trauma and especially in the unconscious state, breathing difficulties are often caused by a mechanical factor. Partial obstruction of the upper respiratory tract is characterized by inhalation stridor, which is easy to hear if you bring the ear to the patient's mouth, and complete obstruction leads to severe cyanosis and cessation of breathing. In such cases, it is necessary to urgently clear the airways. Respiratory failure caused by pneumothorax, hemothorax or hemopneumothorax should be urgently remedied.

The cause of dyspnea may indicate the type of breathing. It is determined by the frequency, depth of individual respiratory movements and the intervals between them. With severe bleeding, respiratory disorders are caused by a lack of oxygen and is expressed in shortness of breath. It is manifested by the deepening and frequency of individual respiratory excursions. Deepening of breath without its frequency can be caused by acidosis (*Kussmaul's breath*). Pain, decreased respiratory surface of the lungs and heart failure lead to shallow breathing. At a brain pathology the periodic breath (Cheyne-Stokes) is observed. With thoracic trauma and editing dyspnea, cyanosis and pathological type of breathing can be caused by a violation of respiratory mechanics.



Respiratory arrest is observed in pain, hemo- or pneumothorax, it is expressed in the restriction of respiratory excursions of the chest. Dangerous paradoxical breathing that occurs with double multiple rib fractures.

With a decrease in circulating blood volume (hypovolemia) may develop a clinical picture of shock. The remaining volume of blood is distributed almost exclusively between such vital organs as the brain, heart, kidneys and liver (centralization of blood circulation). This leads to a decrease in blood supply to other organs and tissues of the periphery. If this mechanism is not interrupted at the right time on their own or with the help of medical measures, it becomes irreversible and leads to death. The prognosis of shock depends, on the one hand, on weight, and, on the other hand, on duration. In this regard, the prognosis is determined by the rapid recognition and urgent implementation of anti-shock measures.

The first step is to restore the lost volume of blood. Here again, only the sign, not the exact diagnosis, is the basis for a treatment effort. It is considered a rule that a patient in shock can not be operated. In most cases, the patient can be brought out of shock or improve his/her condition within 2 hours with the help of drugs that tonify the vascular wall and infusion-transfusion therapy. But if all these measures do not lead to success, it is necessary to resort to urgent surgical cessation of bleeding, despite the shock. This tactic is often prognostically unfavorable, but it gives the last chance to save the patient's life.

**Symptoms of shock:** the patient's consciousness is almost always preserved. Sometimes there is a discrepancy between the patient's behavior and its severity (erectile phase of shock). With severe bleeding, there may be anxiety, agitation, chest pain, fear of death. Only severely bled patients or those who additionally have a traumatic brain injury are unconscious. However, traumatic brain injury almost never leads to shock. In these cases, you should look for other damage.

Subjective symptoms: always a strong feeling of thirst. It increases in parallel with blood loss. Lack of air is a manifestation of reduced oxygen transport

function of blood (erythrocytes). Nausea occurs with any massive loss of blood volume and can turn into vomiting, which makes it difficult to differentiate with brain damage.

Objective symptoms: pale skin and mucous membranes, fingers, toes and tip of the nose - cyanotic. The skin is cold to the touch, covered with cold sweat. If the peripheral parts of the body are warmed during treatment, it is possible to assume the disappearance of the centralization of blood circulation and at the same time the reduction of the deficit of circulating blood volume. Pulse of poor filling, frequent, sometimes barely palpable due to low amplitude. Measurement of blood pressure (BP) is inversely proportional to the pulse, expressed as a "shock index":

$$\frac{\text{Pulse}}{\text{AP}} < 1 \quad (60 : 120 = 0,5 = \text{norm}).$$

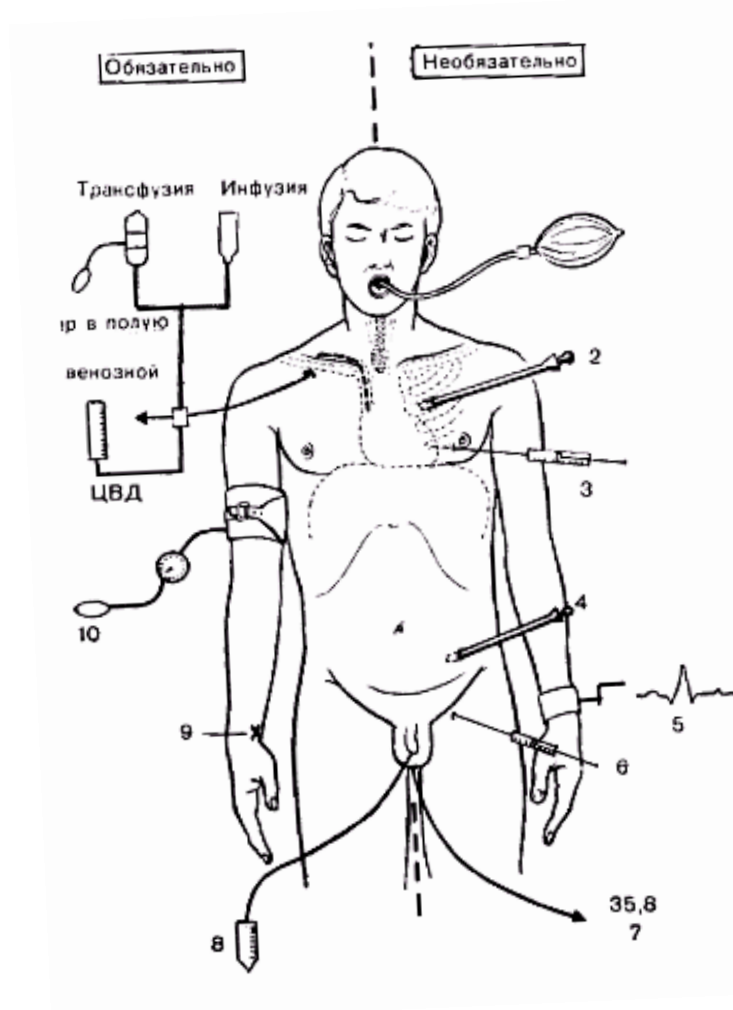


Fig. 200. **First aid for severe injury.** On the left - mandatory events. Right - optional activities that depend on survey results. 1- oxygen supply, suction, intubation; 2- Bulau drainage; 3- puncture of the pericardium; 4- lavage of the abdominal cavity; 5- constant ECG - supervision; 6- arterial blood sampling (gas blood test) or pulse oximetry; 7- temperature; 8- permanent catheter; 9- pulse; 10 - blood pressure.

Loss of volume up to 30% gives an index of about 1, while the pulse and blood pressure are within 100, further drop in blood pressure and heart rate above 100 gives an index greater than 1, with blood pressure 80 and heart rate 120 and a

shock index of 1.5 there is an acute danger to life. Central venous pressure (CVP) is a valuable criterion. Its size is reliable only when a venous catheter is inserted into the superior vena cava or right atrium (checked radiologically). CVP is measured in the position of the patient lying on his back, with the zero point lying below the sternum on 2/3 of the sagittal line of the torso. Normally, it is equal to 4-8 mm of water. Smaller values indicate the mistake in determination of CVP, at the same time in case of thoracic injuries, traumatic brain injury, pulmonary hypertension, right ventricular failure, its size is increased, despite the error of cerebral blood volume (CBV). In this regard, high blood pressure does not always reflect hypervolemia.

At shock there is a urine delay. Make an hourly measurement of the amount of urine after the introduction of a permanent catheter into the bladder. Decreased urination below 30 ml per hour means a danger to the kidneys and is an expression of insufficient CBV. However, this is the rule only when the excreted urine has a high proportion, it reflects the osmolarity.

Dangerous and prognostically unfavorable septic shock. It is caused by various factors, but it is based on the oppression of all natural defense mechanisms due to the flood of the body with bacterial toxins. Both CBV loss and adrenal insufficiency play an important role in the symptoms of this shock. In the late stage, there are also hepato-renal failure and disorders of the blood coagulation system.

The most common cause of shock is the loss of CBV. Significant CBV losses can occur with intestinal obstruction, peritonitis or severe burns. In these cases, instead of blood volume, water and electrolytes are lost. If the loss is slower, the acute danger is insignificant.

*An allergic incident* is sometimes referred to as shock. Because it is preceded by an injection of drugs or an insect bite, the diagnosis is not difficult. It should not be equated with genuine shock.

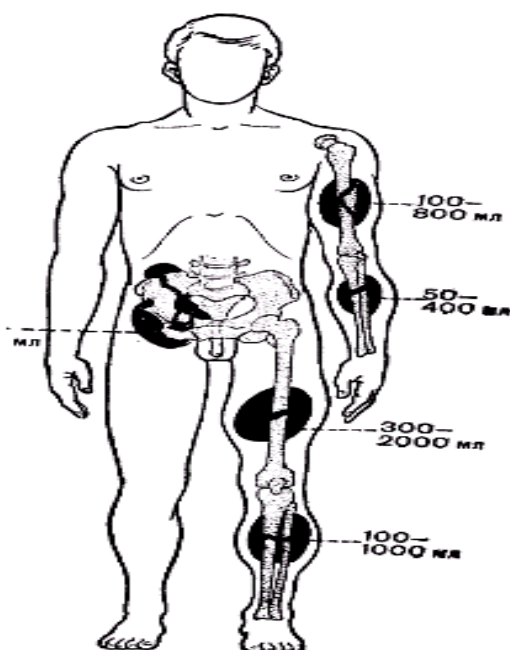


Fig. 196. Patient with severe trauma, accompanied multiple bone fractures. Volume of blood loss in milliliters.

### Fat embolism syndrome.

Fat embolism occurs when the diameter of fat droplets is much larger than the diameter of finely emulsified fat droplets contained in plasma. These fat droplets get stuck in small vessels, especially in capillaries and arterioles, and act as emboli. The reason for the formation of such abnormally significant fat droplets has not yet been established with certainty. Some facts indicate a violation of emulsification, others – washing of fat from the bone marrow, the third - a disorder of fat metabolism in the content of active mobilization of fat or its breakdown.

However, not only fat drops are responsible

for this disease. Here the disorder in microcirculation and coagulation system of blood in the maintenance of a traumatic coagulopathy and a hypoxia plays the big role.

The combined effect of all these factors is manifested mainly in the small circle of blood circulation (*pulmonary form*). Brain manifestations are less common and the worst in terms of prognosis (*brain form*). Then the kidneys, skin, heart and gastrointestinal tract may be affected. Hemorrhagic infarcts and petechiae are formed everywhere, in which it is not always possible to find fat drops during pathological and anatomical examination. Any injury with multiple fractures is dangerous in the occurrence of fat embolism; but even an isolated fracture of a small tubular bone, frequent soft tissue injuries or burns can in rare cases lead to the development of fatty embolism. Most often, fat embolism occurs with fractures of the pelvis and thigh bones. It usually appears within 48 hours after the injury, but can occur within a few days.

Main signs:

- respiratory failure with rapid breathing and untreated tachycardia;
- disorder of consciousness after a light interval;
- hyperthermia;
- sometimes undefined neurological disorders.

Transfusion-resistant tachycardia without symptoms of shock, accompanied by acute disorder of consciousness, has always been suspected of fat embolism. The same applies to fever that occurs a few hours after the injury, which cannot be explained by infection or resorption. Depending on the predominance of cerebral or pulmonary signs, signs of respiratory failure or neurological and mental symptoms come to the fore. In a large percentage of cases (up to 60%) petechiae appear in typical places (inguinal cavities, supraorbital fossae, shoulders and upper chest). If they are, then it is almost pathognomonic for diagnosis.

**Tetanus.** With any open injury there is a risk of infection with tetanus (Cl. Tetanus). The incubation period is from 5 to 21 days and more: the shorter it is, the more severe the disease might be.

***Early signs:***

- itching and burning in the wound;
- muscle twitching and tension in the circumference of the wound;
- sweating;
- hypertension;
- pain in the neck and teeth with swallowing disorders;
- hyperreflexia on the injured side;
- respiratory failure due to violation of respiratory mechanics.

At the same time the general symptoms of an inflammation are absent.

***Late signs:***

- face - sardonic smile, jaw - trismus, back and nape - opisthotonus;
- convulsions;
- dysfunction of the bladder and swallowing;
- paralysis of the respiratory muscles and shortness of breath.

**Gas gangrene.** In etiology, three main anaerobic pathogens play a role: cl. perfringes, cl. septicum, cl. oedematiens.

There are the following forms:

- emphysematous or classical - gas infiltration of tissues, detected by palpation or radiology: caused by cl. perfringes;
- edematous-toxic - progressive infiltration, pale and tense skin: caused mainly by cl. septicum, cl. edema;
- mixed forms - edema and gas infiltration are expressed equally;
- forms of putrefaction - the most common is cl. sporogenes;
- phlegmonous form - there is emphysema and edema, but they are less pronounced, masked by pus, do not tend to spread.

Signs of anaerobic infection usually appear within the next 3 days of injury.

The onset is severe, the earliest sign is the pain in the wound, a feeling of dissection and severe compression locally in the area of injury. The wound has a lifeless appearance covered with a plaque of dirty gray color, the amount of secretion decreases sharply becomes secretive. Protruding from the wound muscles in a dim color, bloodless.

In the edematous-toxic form - significant, rapidly increasing edema. The muscles in the wound look viable, the skin is tense, shiny, bloodless - "white skin" or "white swelling".

Patients are excited, multilingual. Then comes inhibition to loss of consciousness.

**Traumatic toxicosis** (syndrome of prolonged crushing of tissues, crush syndrome). The last decade is characterized by numerous catastrophes, natural disasters as a result of people find themselves under the ruins of destroyed houses, compressed during several hours by various objects, which lead to the development of traumatic toxicosis.

Plasma loss of up to 30% occurs as a result of destructive painful irritation, neuroendocrine and neurohumoral disorders.

**1-st period** - up to 48 hours after the release of victims from the wreckage. Up to 4-6 hours after the release, the condition is satisfactory, blood pressure and heart rate are close to normal. 4-6 hours later the hypostasis is sharply expressed, and 12-24 hours later it reaches the maximum sizes. Lethargy, inhibition, nausea, vomiting, cold sweat, blood pressure up to 80-60 mm Hg. – clinic of shock. Pathology in urine: protein, cylinders, myoglobin, its color is red.

**2-nd period** - from 3 to 10-12 days. Initially, short-term improvement: normalizes blood pressure, reduces swelling and pain in the extremities. Then the clinic of acute renal failure, uremia increases.

**3-rd period** - reconstruction since 3rd week. Consequences of compression: ulcers, osteomyelitis, phlebitis, etc.

There are 4 degrees of severity of traumatic toxicosis:

1. **Mild** - the duration of compression of one limb does not exceed 4-6 hours.
2. **Medium** - compression of the one limb for up to 6 hours. Kidney function suffers a little.
3. **Severe** – compression for 7-8 hours.
4. **Extremely severe** - compression of two limbs for 6 hours and more.

**Sepsis.** It has been established that both bacteria and necrotized tissues can cause a generalized reaction of the organism. At the agreed consensus conference in 1992, the term “systemic inflammatory response syndrome” was adopted (SIRS). The conference also concluded that a systemic inflammatory response caused by a proven infection defined as sepsis. Sepsis and its complications are an increasing sequence of clinical and pathophysiological phases: sepsis, severe sepsis, hypotension, septic shock.

First of all, the lungs, which are the main target organ, are affected, the intestine is the engine of sepsis, infection and intestinal toxins lead to local activation of cells of the immune system, the production of cytokines.

Obvious signs of sepsis: fever and hyperventilation with tachycardia. Hypothermia is more common in elderly patients.

Clinical signs of septic condition: body temperature  $> 38\text{ }^{\circ}\text{C}$  or  $< 36\text{ }^{\circ}\text{C}$ , heart rate  $> 90 / \text{min.}$ , respiratory rate  $> 20 / \text{min.}$ , leukocytes  $> 12000 / \text{ml}$  or  $< 4000 / \text{ml}$  (or young forms  $> 10\%$ ).

Severe sepsis: low blood pressure, oliguria, azotemia, impaired consciousness, bilirubinemia with hemostasis – DIC syndrome. Rapid weight loss is characterized mainly by peripheral muscles, increased function of the proteolytic system.

### **Thermal burns**

#### **Superficial burns:**

I degree - redness and swelling of the skin.

II degree - death and detachment of the superficial layers of the epidermis, vesicles.

#### **Deep burns:**

III degree - complete death of the skin.

IV degree - necrosis of the skin and underlying tissues.

The size of burns is determined as a percentage of the entire body surface "rule of nine": the surface of the head and neck - 9%, the surface of one upper limb - 9%, lower - 18%, anterior and posterior surface of the torso - 18%, perineum - 1%. For children under 7 years old, the "Clarkson scheme" is used: head and neck - 12%, arm area - 6%, chest and abdomen - 24%, back - 24%, legs - 12%, crotch - 1%. "Rule of the palm" - the area of the palm is 1,2 %. The scheme of V.A. Dolinin and G.D. Vylyavina - a sketch of the silhouette of the human body drawn in millimeter cubes.

If the area of superficial burns exceeds 10-20%, deep - 5-10%, there is a burn disease. In children and elderly patients, burn disease may be with a smaller area of burns. Respiratory burns are equal to 15-45% of deep burns.

#### ***Periods of burn disease:***

1. Burn shock up to 3-4 days.
2. Burn toxemia up to 10-14 days.
3. Septicotoxemia since 14<sup>th</sup> day.



#### 4. Convalescence.

There are 4 degrees of severity of burn shock according to the lesion severity index (LSI), which summarizes the area and depth of the lesion: 1% of burns I-II. take for 1 unit., 1% burns III A st. - for 2 units, 1% of care III st. - for 3 units, 1% of the IV st. - for 4 units For every 1 year older than 60 years add 1 unit; for thermal lesions of the respiratory tract - from 15 to 45 units.

***Mild burn shock*** – LSI up to 30 units, pale skin, rarely shaking, moderate thirst, no vomiting. Consciousness is clear. Pulse 100-110 beats / min., Blood pressure - slightly changed. Normal daily amount of urine. Ht - 0.46-0.53 l / l, Hb - 150-160 g / l, total protein - up to 60-56 g / l, a moderate decrease in serum sodium. Lasts from 24 to 36 hours.

***Burn shock of moderate severity*** – LSI from 31 to 60 units, "goosebumps", shaking. Consciousness is preserved. Pulse 110-120 beats / min., Blood pressure - slightly elevated. Ht - 0.53-0.56 l / l, Hb - 160-170 g / l, total protein - 54 g / l, hyponatremia, concentrated urine. Lasts from 36 to 48 hours.

***Severe burn shock*** – LSI from 61 to 90 units, agitation is replaced by inhibition, nausea, vomiting, acrocyanosis. Pulse 120 beats / min., Blood pressure - labile, low pulse pressure. Ht - 0.58-0.65 l / l, Hb - 170-180 g / l, total protein - 52 g / l, hyponatremia, cellular hyperhydration and extracellular hypohydration, oliguria (urine at least 30 ml / hour), urine dark color. Lasts from 48 to 72 hours.

***Extremely severe burn shock*** – LSI over 91 units and more, inhibition, confused consciousness, marbling of the skin, trembling, strong thirst, nausea, vomiting of dark stomach contents. Pulse 120-130 beats / min., Blood pressure - low, low pulse pressure. Paresis of the gastrointestinal tract. Ht - 0.65-0.68 l / l, Hb - 180-190 g / l, total protein - 52-50 g / l, hyponatremia, hyperkalemia, dyshydria, oligoanuria - (urine from 30 to 5 ml / hour), urine the color of meat slops. Lasts up to 96 hours.

Acute burn toxemia is characterized by: CNS dysfunction from emotional to mental states with disorientation in time, place. Increases BCC, decreases OPS, tachycardia, microcirculation disorders, respiratory disorders, loss of appetite,

nausea, polyuric phase of GPN with the appearance of pathological elements in the urine, hyperthermia, fever, absolute and relative anemia, hypo- and dysproteinemia, leukocytosis with shift of the formula. There are 4 degrees of severity of acute burn toxemia: mild, moderate, severe and extremely severe. For this purpose, use LSI (as in burn shock).

### **SOME METHODS OF BLOOD CIRCULATION DISORDER DETECTION IN THE TESTICLES.**

In case of inguinal hernias, especially inguinal-scrotum, an increase in intra-abdominal pressure leads to circulatory disorders (stagnation) of the testicle, which influent to its function.

Disorder of regional blood circulation in the testicle on the side of the hernia are caused by a disorder of hemodynamics of extraorganic vessels and morphological changes in intraorganic vessels, which, obviously, should be considered one of the possible etiopathogenetic factors of male infertility.

Chronic circulatory disorders in the testis occur in the presence of inguinal hernia, the contents of which create periodic or permanent compression of the blood vessels of the spermatic cord. Morphological studies of the testicle on the side of the inguinal hernia have shown a disorder of spermatogenic function of the body. At the same time as the function of the testicle decreases, its atrophy develops.

Often the herniotomy itself has a negative effect on the testicle. It revealed the disorder of vascularization in the human testicle could occur after inguinal hernia surgery with the subsequent formation at the site of intervention the scar cords, which involve a. testikularis and a. ductus deferentis. Therefore, to prevent as many of these complications as possible, it is necessary to examine the state of blood circulation of the testicle before and after surgery for inguinal hernia.

One of the methods of examination of testicular blood flow is longitudinal rheotesticulography: one disc electrode with a diameter of 20 mm (manufactured) place on the skin above the elements of the spermatic cord near the testicle, the

second same electrode - on the skin of the scrotum in the projection of the testicle. The electrodes fix by means of an arc-spring, which provides a stable pressure in the range of 0.6 - 0.9 kPa. The previously studied area shaved and treated with 96° alcohol and warm physiological NaCl solution. Between the electrodes and the skin is a two-layer gauze pad soaked in saline. To reassure the patient convincingly prove the safety and security of the research method. Recording perform in a horizontal position of the patient with delayed breathing on exhalation.

Rheograms can be recorded with a two-channel electrocardiograph. After connecting the rheograph to the equipment, it heats up for 5-10 minutes. The total tissue resistance (impedance) is automatically registered. At a chart speed of 10 mm / sec, calibration is performed. The calibrated signal is 0.1 Ohm. Then register the reotesticulogram at room temperature + 20-22 °C. In parallel with the registration of the rheogram, an ECG is recording in the second standard lead.

During the rheographi waveform it has been possible to judge the state of hemodynamics of the studied area or organ. The shape of the rheographic wave is determined by the steepness of the slope, the configuration of the anacrotic and catacrotic phases of the curve, the nature of the vertex, the expressiveness and location of additional teeth. The configuration, amplitude and temporal parameters of the rheographic curve are dependent on the contractile capacity of the myocardium, the state of capillary and venous circulation.

In people with an elastic and pliable vascular wall, the rheographic wave is characterized by a fairly fast, steep ascent and slow descent, fairly high amplitude, sharp tip and well-defined dichroic teeth located on the lower part of the curve. Because the extensibility of the vascular wall depends not only on its elasticity, but also on the tonic stress, the steepness of the slope of the anacrot gives an idea of the state of vascular tone. The duration of the anacrotic phase of the rheographic wave is determined by time from the beginning of the curve to the point of its maximum rise. The duration of anacrotis reflects the change in hemodynamics of the studied organ in the subphase of rapid expulsion, ie during the period of maximum stretching of the arteries by blood.

It is known that normally there is a clear and almost constant linear relationship between the duration of systole and the entire cardiac cycle. Therefore, most researchers measure the duration of the anacrotic phase as a percentage of the duration of the entire wave, i.e. the cardiac cycle.

M.A. Ronkin believes that the absolute value of the eastern part of the rheographic wave is a clear indicator of the ability of the vascular wall to stretch the flowing blood. For this purpose it is possible to use an indicator of blood filling (K) which reflects blood filling of the investigated body in connection with a condition of a tone of vessels (fig. 187).

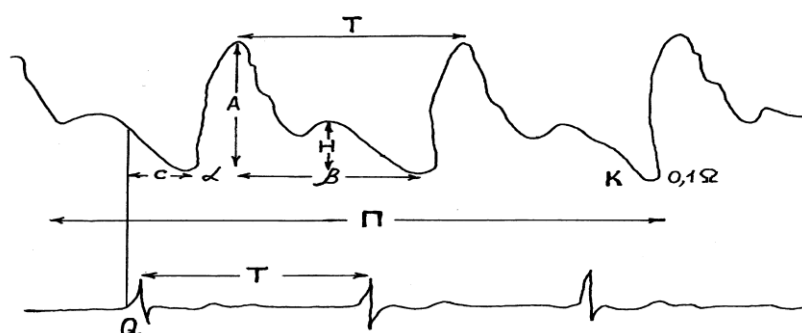


Fig. 202. X-ray and pulsation (P) of the right testicle of a healthy person (24 years old).

T is the duration of one cardiac cycle,

C is the duration of the propagation of the rheographic wave, and is the duration of the anacrotic phase (systolic rise),

$\beta$  is the duration of the catacrotic phase;

A is the height of the amplitude of the main rheographic wave,

H is the height of the dichroic tooth,

k is the value of the calibrated pulse (standard resistance - 0.1 Ohm).

X-ray is analyzed by following indicators: the shape of the curve; the presence and expressiveness of additional waves; the presence of a venous (presystolic) wave; rheographic curve recording time (cardiac cycle time); basal tissue resistance of the elements of the vas deferens (R). Tissue edema was

evaluated by the basal resistance - the lower it is, the more pronounced the edema; duration of the cardiac cycle (a%); the amplitude of the main rheographic wave in Ohms (A Ohm). The amplitude was calculated by dividing the height of the curve in mm by the height of the calibrated signal in mm and multiplied the obtained value by 0.1 Ohm:  $A \text{ (Ohm)} = A \text{ mm} \times 0.1 \text{ Ohm} / \text{to mm}$ ; blood filling index (K) - the ratio of the amplitude of the main rheographic wave in Ohms to the duration of the anacrotic phase in%:  $K = (A \text{ (Ohm)} \times 100) : a\%$ .

When analyzing the rheograms of the right and left testicles, regardless of age, there are 3 main types of rheograms:

**Type I** - X-ray is presented in the form of a presystolic wave, a steep systolic rise, a sharp top of the main curve and 2-3 dichroic teeth, the top of which exceeds or is at the level of the top of the main curve;

**Type II** - X-ray has a presystolic wave, steep ascent and descent with a sharp top of the main curve, 2-3 dichroic teeth gradually rise from the isoline;

**Type III** - X-ray in the form of a presystolic wave, a flat systolic rise, a rounded top, a smoothed dichroic tooth located in the upper third of the catacrope.

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