MINISTRY OF HEALTH OF UKRAINE
ZAPORIZHZHIA STATE MEDICAL UNIVERSITY
Department of physical rehabilitation, sports medicine,
physical education and health

A. O. Ivchenko, S. M. Kanygina, O. O Cherepok

REHABILITATION OF DISEASES AND LESIONS OF THE MUSCULOSKELETAL SYSTEM

Study manual for 4th year medical students studying the discipline "Physical Rehabilitation and Sports Medicine"

Zaporizhzhia
2023

UDC 615.8:616.7(075.8)
I-98

Approved by the meeting of the Central methodical committee of Zaporizhzhia State Medical University and recommended for the use in educational process for foreign students. (Protocol No 2 from 08.12.2022)

Authors:

A. O. Ivchenko **-** MD, Assistant Professor of the Department of Physical Rehabilitation, Sports Medicine, Physical Training and Health, Zaporizhzhia State Medical University.

S. M. Kanygina **-** MD, PhD, Associate Professor of the Department of Physical Rehabilitation, Sports Medicine, Physical Training and Health, Zaporizhzhia State Medical University.

O. O. Cherepok **-** MD, PhD, Assistant Professor of the Department of Physical Rehabilitation, Sports Medicine, Physical Training and Health, Zaporizhzhia State Medical University.

Reviewers:

M. L. Holovakha - MD, PhD, D of Sc, Professor, the Head of the Department of Traumatology and Orthopedics Zaporizhzhia State Medical University.

M. O. Kozhemiaka - MD, PhD, Associate Professor of the Department of Traumatology and Orthopedics Zaporizhzhia State Medical University.

Ivchenko A.O.

I-98 Rehabilitation of diseases and lesions of the musculoskeletal system : Study manual for 4th year medical students studying the discipline "Physical Rehabilitation and Sports Medicine" / A. O. Ivchenko, S. M. Kanygina, O. O. Cherepok. – Zaporizhzhia : ZSMU, 2023. -96 p.

Study manual is based on the current curriculum and program in the discipline "Physical Rehabilitation and Sports Medicine" for students studying on 222 «Medicine» and 228 «Pediatrics» is compiled in accordance with the curriculum for the training of specialists in the second (master's) level of higher education in the field of study 22 «Health protection» prepared on the basis of the draft higher education standard of the second (master's) level of education for higher education graduates of the Master's degree in the field of study 22 «Health protection».

CONTENTS

INTRODUCTION

Study manual is based on the current curriculum and program in the discipline "Physical Rehabilitation and Sports Medicine" for students studying on 222 «Medicine» and 228 «Pediatrics» is compiled in accordance with the curriculum for the training of specialists in the second (master's) level of higher education in the field of study 22 «Health protection» prepared on the basis of the draft higher education standard of the second (master's) level of education for higher education graduates of the Master's degree in the field of study 22 «Health protection».

The motor activity is the major condition of life and normal functioning of the man, which has not only biological, but also social importance. Therefore, definition of an optimum doze of physical loads not only the competence of sports doctors, but also has the direct relation to the doctors almost of all specialities. Is not present of the unit of clinical medicine, in which there would be no questions connected with the motor modes, and also, with the usage of physical exercises as means of preventive maintenance and improvement, treatment and restoration.

The sports medicine is a clinical discipline, which studies positive and negative influence of physical loads of different intensity (from hypo- up to hyperdinamy) on the body of a healthy and sick person.

The purpose: optimisation of motor activity of the man for improvement and strengthening of health, increase of a functional condition level, growth of sports achievement, and also preventive maintenance and treatment of diseases.

The main tasks of the sports medicine:

- the definition of a condition and level of health, and also conformity of physical loads to functionalities of a body at different stages improving or sports training;
- qualified medical aid in case of infringement of health, which are connected with occupations by sports or physical culture;
- participation in the training process management;
- sanitary - hygienic and medical maintenance of training process;
- realisation of the rehabilitation of the persons, who are engaged in physical culture and sports, after diseases and injuries.

Physical rehabilitation is a part of medical and social rehabilitation. One of the most impotent mean of physical rehabilitation is the medical physical culture - method of treatment, which uses means of physical culture for restoration of health and work capacity of the patient. It's method of active, functional, pathogenetic and training therapy.

The method of medical physical culture facilitates and accelerates processes of rehabilitation of physiological functions of the patient, causes increase of functional reserves and functional adaptation to household and professional loads.

The main purpose of discipline is to develop in students a holistic understanding of the possibilities, forms and methods of medical control in the health and sports training, as well as during physical rehabilitation, understanding the importance of timely application of physical culture for disease prevention, as well as in complex restorative treatment various profiles.

The lack of the necessary modern educational literature on topical issues of sports medicine and physical rehabilitation was the reason for the preparation of this publication by the staff of the Department of Physical Rehabilitation, Sports Medicine, Physical Education and Health of Zaporozhye State Medical University.

CLASSIFICATION OF JOINTS AND THEIR MOVEMENT

The structure of the joints.

One of the most important properties of a living organism is movement in space. This function in mammals (and humans) is performed by the musculoskeletal system apparatus. MSA include the bones of their joints and muscles. MSA is divided into two parts:

- Passive part - bones and their joints (f-16%, m-18%);
- Active part - muscles (f-38%, m-42%).

All the bones of the human body and vertebrates are connected by using different ways into a harmonious system that provides from one on the one hand quite high strength, and on the other hand creates considerable mobility components of the joint. The science that studies the connection of bones is called arthrology. The nature of the connection depends on the structure and function of one or another links.

A joint is a movable joint of 2 or more bones with a slit-like cavity between them.

Each joint has 4 mandatory structural elements (components):

1. At least two articular surfaces (facies articulares), which are covered with hyaline cartilage and have:
   - articular fossa (fossa articularis);
   - the head of the joint (caput articulare).
2. Articular capsule (capsula articularis), consisting of:
   - fibrous membrane; fibrous layer (membrana fibrosa; stratum fibrosum);
   - synovial membrane; synovial layer (membrana synovialis; stratum synoviale), which has synovial folds (plicae synoviales) and synovial villi (villi synoviales).
3. Articular cavity (cavitas articularis), which may have:
   - articular recess (recessus articularis);
   - synovial vagina (vagina synovialis);
   - synovial sac (bursa synovialis).
4. Synovia (synovia) - synovial fluid that moistens the joints surface. It is produced by cells of the synovial layer.

Auxiliary formations are necessary for the normal functioning of many joints in addition to the basic elements. Auxiliary elements of the joint: ligaments, intra-articular cartilage, menisci, synovial folds, synovial sacs, articular lip, sesamoid bones.

Classification of joints.

Joints by structure are divided into:

– simple joints (articulationes simplices), which consist of two articular surfaces (facies articulares);

– complex joints (articulationes compositae) with more than two articular surfaces (facies articulares);

– combined joints (articulationes combinatae), which are anatomical separated but interconnected by a common function;

– complex joints (articulationes complexae), in the cavity of which there are articular discs (disci articulares) or articular menisci (menisci articulares), which divide the articular cavity (cavitas articularis) into two or more sections.

Joints by function are divided into:

– uniaxial joints;

– biaxial joints;

– biaxial joints.

Uniaxial joints in shape include:

– cylindrical joints (articulationes cylindricae) in which movements occur around the longitudinal axis (axis longitudinalis); these joints are also called rotating joints (articulationes trochoideae);

– block-like joints (ginglymi) and their variety – helical joints (articulationes cochleares).

Biaxial joints include:

– bifurcated joints (articulationes bicondylares);

– elliptical joints (articulationes ellipsoideae);

– saddle joints (articulationes sellares).

To the triaxial joints; biaxial joints include:

– flat joints (articulationes planae), which may be immobile joints (amphiarthrose);

– spherical joints (articulationes spheroideae);

– cup-shaped joints (articulationes cotylicae).

The greater the congruence (compliance) of the articular surfaces, the smaller the amount of movement in such a joint. This is the basic law of the system of connections (arthrosyndesmology).

Osteokinematics. Arthrokinematics.

Osteokinematics - the study of bone movements in space.

To describe the movements in the joints in the anatomy use three main axes:

- sagittal;
- frontal;
- vertical.

The sagittal axis is directed from front to back, perpendicularly frontal plane.

Movements: reduction, removal, lateral inclinations.

The frontal axis is left to right or right to left, perpendicular to the sagittal plane.

Movements: flexion, extension.

The vertical axis is directed from top to bottom, perpendicular horizontal plane.

Movements: external and internal rotation, supination, pronation.

To describe the movement of bones, 2 axes are considered:

- longitudinal (along the bone);
- mechanical (as if perpendicular to the articular surface of the bone). They may or may not match.

Arthrokinematics - the study of the movement of articular surfaces.

There are three main components of the movement of articular surfaces: torsion, sliding, rolling. Movement in the joint - a combination of 3 components.

Additional movements and joint play.

Additional movements are passive movements that can be performed loosely concluded position. These include rotation, sliding, extraction.

Extraction is a specific additional movement against the direction of force of the muscles passing through the joint.

There are 3 stages of joint extraction:

1. Neutralization of pressure in the joint.
2. Separation of joint surfaces, removal of backlash in the joint bag.
3. Real stretching of soft tissue structures around the joint.

If there are no additional movements, the movement of bones is impossible.

The set of additional movements is called "joint play". Used - for the diagnosis and treatment of hypomobility.

BALANCE OF EXCHANGE PROCESSES IN JOINTS

Motor activity and metabolism in the musculoskeletal system.

Depending on the nature of motor activity, human skeletal muscles can work in dynamic, static and mixed modes. During movement due to increased metabolism in accordance with A. Krog's rule increases the number of open capillaries in the muscles. Increased blood flow to the muscles helps to increase their temperature causes a decrease in viscosity (friction forces between individual fibers), and therefore facilitates the implementation of physicochemical properties of muscles that directly affect the productivity of work performed. At static efforts muscle vessels are compressed, blood circulation in the muscle almost stops. Small the amount of O2 in myoglobin cannot be maintained aerobic mode of energy supply, in connection with which anaerobic prevails mode using creatinephosphokinase reaction and glycolytic phosphorylation.

Systematic motor activity causes work hypertrophy muscle fibers, increasing the capacity of the capillary network in the muscles, the content myoglobin, glycogen, ATP, CF, respiratory enzymes. In the fibers the number of mitochondria increases. The latter contribute to the growth of ability muscles dispose of pyruvate. This limits the accumulation of milk acid and provides the ability to mobilize fatty acids, increases the ability to intense and prolonged muscular work. In parallel there are changes in the central link of motor units - in α-motoneurons, which are hypertrophied with a simultaneous increase in their respiratory content enzymes. At a static mode of activity of muscles at them occurs deeper reorganization of the vascular system and nerve endings: capillaries change the course are not parallel to the muscle fibers, and entwine them axons of neurons of motor units are divided into more terminal, suitable for muscle fibers. The reliability of the musculoskeletal system increases due to the increase in the diameter of the tubular bones and thickening of their compact substance.

As the motor loads are repeated, the motor is functional the system becomes increasingly reliable.

When creating each rehabilitation program there are a number of problems which should be decided by a specialist:

- individual selection of physical activity;
- gradual increase of loads.

Objective: to find the "norm" of loads and motor activity for each patient.

Nutrition of joints.

Cartilage (latin cartilago) is a type of connective tissue in the body of some invertebrates (eg, cephalopods) and all vertebrates, performs support-mechanical function. In ontogenesis, cartilage develops from the mesenchyme.

Cartilage tissue is represented by cells (chondroblasts and chondrocytes), located alone or in groups, and surrounding them intercellular substance consisting of collagen, rarely elastin, fibers and the so-called basic (amorphous) substance. Fibers are built from molecules of one of the types of collagen (type II), which is not found in bone or fibrous connective tissue, as well as elastin protein. They form a chain, the density of which increases around the cells.

The main substance consists of high molecular weight polyanions - galactosamine glycans and glucosamine glycans (chondroitin sulphates, keratosulfates, hyaluronic and sialic acids, heparin), creating complexes with proteins - proteoglycans, the molecular structure of which determines the elasticity of cartilage. The mechanical properties of cartilage depend on features of intercellular substance. Hyaline cartilage is characterized relatively large amount of basic substance.

Cartilage is covered with cartilage, the cells of which are able to turn into chondroblasts, providing peripheral cartilage growth so-called overlays (increase in the mass of intercellular substance). Cartilage growth can also occur due to the division of its cells (insert growth).

There are no blood vessels in the cartilage. In articular cartilage nutrition comes from the synovial fluid and vessels of the bone.

Synovium is a sticky, viscous liquid, the chemical composition is like blood plasma, and there is also mucin (a glucoprotein containing polysaccharides) and foods metabolism: cartilage and synovial membrane cells, fat droplets, protein, salt, mucus. Functions: nourishment and lubrication of cartilage.

Levels of tissue breakdown. Levels of tissue reproduction.

Our body balances 2 processes: the process of tissue breakdown (as a reaction on load) and the process of tissue repair. The norm is the balance of destruction and recovery over a long period of time (degeneration - regeneration).

The nature of many MSA pathologies can be considered according to this model:

1. Increased level of tissue breakdown (during training).
2. Reduced level of tissue breakdown.
3. Increased level of tissue formation.

4. Reduced level of tissue formation and reconstruction.

Increased levels of tissue breakdown occur with increasing frequency or the amount of load on a part of the body, or when the ability decreases tissues to self-healing.

The normal reaction to exercise is mild inflammation, in the future - compensation by the formation of more tissue to withstand high degrees of load.

For each tissue there is a critical limit beyond which the level of destruction will exceed the recovery level. First of all it is fabrics with limited ability to regenerate, which are poorly saturated with blood vessels.

Reduced tissue breakdown. Concerning load reduction (hypodynamia), which leads to a decrease in the level of tissue reproduction.

It is necessary to gradually increase the level of loads, focusing on weakened structures. Tissue maturation involves reorientation basic structural elements along those lines that will predominantly be account for the load on this structure.

Increased level of tissue formation. The level of education increases when any inflammatory process. Reconstructive (reparative) phase after inflammation involves increasing the number of collagen cells. The fabric becomes less elastic, loses mobility (especially during immobilization).

Newly formed collagen is not embedded along the load lines, forms abnormal interfiber cross-links that interfere with normal functioning.

Reduced level of tissue formation and reconstruction. Occurs when metabolic disorders: decrease in the number of blood vessels (ischemia), nutrient deficiency, hormonal changes (menopause), age-related changes. Solution: reduce the load according to age.

BIOMECHANICAL PROPERTIES OF TISSUES

Types of forces acting on the body or within it.

The following forces act on the body:

- Stretching - forces acting in different directions along one line: bones, tendons, capsules, ligaments. May cause ruptures;
- Compression - forces acting in the opposite direction along one line. At compression fractures occur compression fractures (vertebrae, lower extremities), when compressing soft tissues - bruises;
- Offset - the action of forces in opposite directions along different lines. Such forces can damage the knee ligaments;
- Bending - force, or forces acting with the lever. When exposed to bone there are fractures, in children - marginal fractures;
- Twisting - spiral movement: spine, legs. The action of such force causes bone fractures, ruptures of soft tissues (in the knee ligaments, capsule, meniscus).

Composition and mechanical functions of tissues.

It is known that the musculoskeletal system consists of skeletal bones joints, ligaments and muscles with tendons, which along with the movements provide supporting function of the organism, allowing it, for example, to rely securely to the surface, while maintaining the full weight of your own body. Bones and joints are involved in passive movements, obeying the action of muscles, but play a leading role in the implementation of support functions.

The structural framework of the joint system is formed by various connective tissue. They include living components - cells and inanimate substances - intracellular material. Cells such as fibroblasts, macrophages, fat and others perform the functions necessary for life support of all tissue. Intracellular material that forms a certain matrix in which the cells themselves live, includes protein collagen and elastin, which determine the physical characteristics of the binder fabrics. But the main connecting elements that form the rigid link of the unified articular system, of course, is the bones, tendons and connections.

Bones are the central structure of everybody segment. Bone is an organ formed by several tissues, the most important of which is bone tissue. The articular surfaces of the bones are covered with hyaline cartilage, the rest the surfaces are covered with periosteum - a dense connective tissue shell. In the thickness the bones pass through the numerous vessels that feed it, and are contained in the cavities bone marrow (red and yellow). Nerves penetrate the bone along with vessels, accompanying them in the haversian canals and in the bone marrow cavities, ending in bone marrow tissue and on the walls of blood vessels.

Fresh bone contains 50% water, 28% organic and 22% inorganic substances. Dried bone consists of a third of organic matter - osein, and two-thirds of mineral salts, mainly calcium, phosphorus. Osein provides elasticity and flexibility of bones, and inorganic substances - strength.

Ligaments and cartilage of the joints have a large margin of safety. And they are important elements, such as tendons, connect muscles and bones, and ligaments provide the connection between the bones of the joint. Home the difference between them is the organization of collagen fibrils that due to their functions. Because the function of tendons is combination of muscular strength of bone or cartilage, and tendon structure provides its lowest tendency to deformation due to tensile forces, produced by muscle.

Although the ligaments are mainly affected by tensile forces, they are the main ones function - stabilization of the joint, so they are arranged to provide multidirectional stability of the joint and its adaptability to action tensile, compressive and displacing forces.

Tendons and ligaments are dense connective tissue that contains collagen, elastin, proteoglycans, water and fibroblast cells. Protein collagen and elastin are synthesized and secreted by fibroblasts. About 70-80% of the raw mass of the tendon and ligament is collagen type fibrous protein, characterized by significant mechanical stability. Collagen fibrils are the unit of tendons and ligaments that carry the main one load. The only difference is that fibrils are placed in the tendons longitudinally and parallel to each other, which provides maximum resistance tensile force. And in the ligaments, the fibrils are placed in parallel, obliquely and even spirally, which provides resistance to forces acting in in various directions.

Each collagen molecule consists of three intertwined ones polypeptide chains. Each chain includes a sequence of almost 1000 aminoacids and is called the alpha chain. Collagen molecules themselves placed in rows end to end, and 5 such rows placed parallel to each other, form a microfibril.

Collagen fibrils, which are the main load-bearing, consists of bundles of microfibrils connected by biochemical bonds cross-links between collagen molecules. These cross connections are both within and between rows of collagen molecules in microfibrils. Therefore, the functional basis of tendons and ligaments is the fibril formed microfibrils, which are interconnected by transverse couplings, from which depends on the strength of the fibrils. Scientists believe that the number and condition of transverse clutches are determined by factors such as age, gender and physical level activity.

It is known that in addition to collagen and elastin, the extracellular matrix of tendons and the bond includes water and proteoglycans. Water combines with them, forming gel, the viscosity of which decreases with increasing level of physical activity. This property is called thixotropy. Tissue elongation resistance at speed depends on its viscosity: the higher the viscosity, the greater the resistance to stretching. As the viscosity decreases, the tissues adapt to stretching at a higher speed. In addition, the viscosity is thixotropic tissue changes as a result of previous body warm-up, or prolonged period of inactivity.

Biomechanical properties of tissue.

Under the biomechanical properties of biological tissues are two their species. One is related to the processes of biological mobility: reduction muscle, cell growth, movement of chromosomes in cells during their division, etc. These processes are caused by processes and energy is chemically provided by ATP. Conventionally, this group is called active mechanical properties biological systems. Another type is passive mechanical properties biological bodies.

The composite structure of the bone gives it the necessary mechanical properties: hardness, elasticity and strength. There are mechanical properties to depend on many factors, including age, individual growth conditions, and, of course, from the skin area.

Rapid deformation of bone tissue provides its mineral substance component, and the creep of bone tissue describes the polymer part (collagen). This is according to the Kelvin-Feucht model of bone mineral composition the fabric can be represented as a piston, and the elastic component - in the form of a spring. Behavior of bone tissue on deformation characterized by the following features:

1) Bone tissue behaves differently in different ways deformation (load). Compressive strength is higher than stretching or bending. Yes, the femur is straight withstands a load of 45,000 N, and when bending -2500 N. But the margin mechanical strength of bones is very significant and the desired ability with which they meet in normal living conditions. It is established that the tensile strength of bone is higher than in oak, and greater strength of cast iron.

2) All the architecture of bone tissue corresponds to the supporting functions skeleton, and the orientation of the bone bar is parallel to the main lines tension that allows the bones to withstand large mechanical load. For example, the long bones of

the limbs that are tucked in main bending, have in the middle part of the tubular shape. It provide the greatest economic use of bone substances, because when bending substances that are close to the longitudinal axis of the body, almost do not participate in the load resistance. In the head of the femur, due to this, under the skin load is formed its own structure – shape Mitchell. All forms are interconnected and have a complex structure.

3) One of the important features of skeletal bones is galtality, such rounding of internal and external corners. Dullness strength and internal stresses in places of abrupt transition.

4) Bones have different strengths depending on the functions used.

The bones of the skull, sternum and pelvis protect the internal organs. Support function produce bones of the extremities and spine. The bones of the legs and arms are long and tubular. The tubular structure provides resistance to significant loads and, together with thus, 2-2.5 times their mass and significantly reduces the moments of inertia. Femur in a vertical position can withstand loads up to 1.5 tons.

5) The implementation of tasks to perform physiologist for the implementation of reference and locomotor functions in the bones are formed zones of varying hardness compliance with the distribution of power loads. Biomechanical properties of tendons and ligaments are often characterized load-deformation relationship in response to tensile load. According to physiologists and doctors, connective tissue more often torn than detached from the bone. Bone mass and strength and muscles decrease with age.

BIOMECHANICS OF MUSCLE SHORTENING

Moment of strength, muscle healing, muscle soon.

In the biokinematic circuits of the body, human movement can be transmitted from links to links. For example, the movement of the hand when lifting a load can be the result of movement and body, as well as movement in the legs of the hands. Movement brush, in this case, a combination of a set of movements of other la. So this movement is a complex movement, and all the principles apply to its analysis complex motion of a rigid body.

Complex motion is formed from the movements that make up this motion in single biokinematic chain. In the simplest cases in mechanics two or more translational 3-5° movements are added. But more often in movements people acting and rotating11 components are now present, moreover, the musculoskeletal system is created in such a way that all movements (in therefore, including translational) are created from combinations of rotational movements in joints. Biomechanical characteristics describe procedural and rotational movements. These characteristics are divided into: kinematic, dynamic, energy. They have different purposes: kinematic – characterize external picture of motor activity; dynamic - carry information about reasons for changes; energy - give an idea of mechanical productivity and efficiency. Kinematics is known to characterize the movement of the body in space. Depending on the change of speeds and their tasks, the movement of body parts a person can be:

1) reverse-rotating;
2) reciprocating;
3) rotating.

The structure of connections of individuals of skeletal links does not allow he is able to move in combination on the principle of "wheel", ie to do endless rotation around the axis of the joint in one direction. Motion limiters (bone formations, soft tissues of joints and muscles) perform movement in the connection within no more than half of the circle, ie almost all the movements are reversible. Reverse rotational movements resemble movements pendulum (oscillating movements) around an axis that is located across or along biokinematic chain (for example, the process of bending-unbending). Special coordination of rotational movements in different biokinematic chains allows kinematic movement in stages (boxer's bone during rotational movements in the shoulder and elbow joints; the torso of the runner when removing the foot, etc.). This is reciprocating movement. Circular (rotational) motion is when the longitudinal axis of the link describes completed surface. Only he can work without the obligatory ones reverse movements.

Dynamics affects the interaction between bodies on their mechanical movement. The choice of dynamic kinematic characteristics cannot be estimated according to the external picture.

To dynamic characteristics:

1) nervous characteristics of the feature (moving),
2) force characteristics (features of interaction of bodies).

Force is a measure of a certain mechanical effect on another body moment of time. Numerically, it has the product of body weight on it acceleration, which is caused by this force: F = ma.

The measurement of force, as well as mass, is based on the second law Newton. The force applied to the body, its acceleration. The source of power is another body, ie two bodies interact. At the same time there is the "action" of the second body on the first, and the "counteraction" of the first body attached to another. According to Newton's interpretation, actions are always the same in magnitude counteraction, other actions of two bodies on each other are always the same in magnitude and opposite in direction.

In movements where all the movements of the body are rotational, feel moment of force. *The moment of force* is a measure of the rotational action of force on the body. It is marked by a vector product of the force on it`s shoulder.

The arm of force is the minimum distance from the axis of rotation to the action of force.

If on a body that can rotate around any point, act together several forces, the addition of moments of these forces should be used rule of adding moments. The moment is positive when there is strength rotation of the body counterclockwise.

The moment is capacious, when the force of rotation of the body by the hour arrow. The longer the arm of force, the greater the moment of force or torque.

"Muscle strength". Active ("partial machine-engine") motor the apparatus is skeletal muscle. When the muscle is excited, it becomes active a force that seeks to bring the ends of a muscle together, to change its length. This muscle traction causes active human movements.

Force is a term used to describe the interaction of an object with other objects of the surrounding world. Force is a vector quantity which characterized by the magnitude, direction and point of application. Muscular the effect can be schematically represented as an arrow having magnitude and direction. Apply muscle strength out of four positions for the analysis of human movement:

- more skeletal create solutions across the joint and can cause segment rotation, this allows you to use many functions the human body from the standpoint of the theory of mechanical machines;
- the human body can be considered as a sequence of rigid segments where soft tissue deformities and fluid movement in the body are not large impact on movement;

- the direction of the muscle strength vector is a straight line between proximal and distal attachment, and force is considered attached at the attachment points. In fact, the muscle is not attached one point, and has a certain area of attachment. But if the size of the area quite small compared to other system sizes, it is attached effort is seen as a point. If the area of muscle attachment is large (for example, trapezius, pectoral muscles) is a muscular effort represented by several lines of action;
- movement occurs when there is an imbalance of forces of the system (law inertia). Mechanical analysis of the action of several muscles that cross the joint allows you to determine the result of muscular effort rather than strength performed by individual muscles.

The main property of skeletal striated muscle tissue is contractile. Shrinking under the influence of nerve impulses, muscle moves the bone levers that connect to each other in the joint - the moving point is approaching the fixation point.

There are several successive stages of muscle launch and exercise abbreviation.

1. The action potential propagates along the motor nerve fiber to its endings on muscle fibers.

2. Each nerve ending secretes a small amount neurotransmitter acetylcholine.

3. Acetylcholine acts on a limited area of the muscle fiber membrane, opening numerous acetylcholine-controlled channels passing through protein molecules embedded in the membrane.

4. The opening of acetylcholine-controlled channels allows large the amount of sodium ions diffuse into the muscle fiber leading to the emergence of the action potential on the membrane.

5. The action potential is conducted along the muscle fiber membrane as follows the same as on the nerve fiber membrane.

6. The action potential depolarizes the muscle membrane, and most the resulting electricity flows through the center of the muscle fiber. This leads to release from the sarcoplasmic reticulum of a large number of calcium ions, which are stored in it.

7. Calcium ions initiate the forces of adhesion between Actin and myosin threads that cause them to slide relative to each other, which is the basis of the process of muscle contraction.

8. After a fraction of a second with a calcium pump in the membrane sarcoplasmic reticulum calcium ions are pumped back and stored in the reticulum until the arrival of new action potential. Delete calcium ions from myofibrils leads to the cessation of muscle contraction.

Types of muscle contractions.

Types of muscle work:

Isometric tension is the contraction of a muscle or muscle group produce an effort that does not change the length of the muscles and the angle in the joints through which they pass.

Isokinetic tension is the contraction of a muscle or muscle group at which the movement of the mixing segment has a constant speed.

Isotonic tension is the contraction of a muscle or muscle group when whose muscle tone is constant.

Concentric tension is the contraction of a muscle or muscle group at which the points of attachment of the muscle converge or decrease length.

Eccentric tension is the contraction of a muscle or muscle group in which the points of attachment of the muscle are removed or increased length.

The concept of final movement in the joint.

The final joint movement (FJM) is the sum of the moments of all forces acting relative to the axis of the joint.

Active forces are the strength of agonist muscles.

Negative forces - forces of deformation of the joint (interaction of the joints surfaces, ligament tension, capsules, skin), tension forces of antagonist muscles. Always directed against the direction of muscle activity.

A healthy joint - active forces are large, and passive - small.

Pathological joint - negative forces are large, active - small.

What affects the FJM:

1. Joint injuries: muscle depression (reflex delay) and reduction of active forces.

2. Immobilization (complete, partial), chronic diseases: reduction active forces (muscle atrophy) and increased negative forces (loss of mobility) articular and periarticular structures, antagonist muscle rigidity/increased tone).

Muscle factors that affect FJM:

1. The ratio of muscle strength to length.

2. The ratio of strength and speed of muscle contraction.

3. Muscle architecture.

4. The moment of action of muscle strength.

Neurological factors affecting FJM:

1. Mobilization of motor units (number of operating motor units, type: fast, slow; size of motoneurons: large, small).

2. The magnitude of the pulse (frequency of signal release).

3. Type of release (pulse synchronization).

EXAMINATION IN PHYSICAL REHABILITATION

The structure of the rehabilitation process.

In the professional scientific and methodological literature components of activity physical rehabilitologist are defined very vaguely. Based on their own Hertsyk A.M. research identifies the following components of physical activity rehabilitologist:

- examination to determine functional disorders and restrictions;
- forecasting the results of rehabilitation interventions;
- planning a rehabilitation program;
- implementation of the rehabilitation program;
- evaluation of results, control and correction of rehabilitation programs.

The components determine not only the content but also the sequence of activities rehabilitation specialist.

The components are closely related, they influence each other. Activity rehabilitologist may be limited to the implementation of only the previous components without following (explain).

Content and components of the rehabilitation examination.

Survey in PR - collection of relevant and accurate information for evaluation physical condition of the patient and the definition of functional disorders and restrictions.

Examination should always precede any intervention. Errors in the survey cause errors in further activities rehabilitation specialist.

The basis of the examination in physical rehabilitation is the examination of the musculoskeletal system.

Rehabilitation examination is always preceded by a visit to the doctor, which establishes a medical diagnosis and considers the appropriateness of referral patient to a physical rehabilitation specialist.

Physical rehabilitologist examines the patient in accordance with the medical diagnosis and contraindications and warnings established by the doctor.

The survey may cover

- anthropometric indicators;
- posture, gait, muscle strength and muscle tone, range of motion in the joints, balance, coordination;
- intensity and nature of pain; basic vital signs;
- functional limitations;
- opportunities for self-care and self-service.

The result of the survey - quantitative and qualitative indicators.

Components of the rehabilitation examination:

- observation (continuous);
- subjective assessment of the patient's condition;
- objective assessment of the patient's condition.

Observations in rehabilitation. Subjective assessment of the condition patient.

One of the components of the rehabilitation examination is observation.

Observation begins immediately and continues during the examination and the whole course of rehabilitation (continuous), especially important before and after each lessons with the patient. The patient should be monitored constantly, but not defiantly. Observe the symmetry of movements, the desire to move, compensatory or individual movements, coordination, balance, functional level, level of independence, risk factors, posture, facial expressions, "body language", muscle size and proportions, edema, folds, scars, color (erythema, cyanosis).

Observation is divided into formal and informal.

It is necessary to compare the information obtained as a result formal and informal.

Subjective assessment of the patient's condition. Subjectively - what he says patient. We ask the patient questions (open and closed).

At this stage: communication between the rehabilitation specialist and patient, a working atmosphere is formed; the rehabilitologist begins to compose

history of motor impairment; there are symptoms that may require interference of other security specialists; the previous (working) version is formed about motor disturbance; a plan for further examination is drawn up.

Subjective information includes:

1. General information about the patient, basic and related medical diagnoses, when established, date of hospitalization (information on medical history).
2. The main complaint - should relate to the motor sphere.
3. Profession, level of daily activity, sports, delight.
4. The occurrence of the problem.
5. When the basic diagnosis and how long they exist, the previous one treatment and rehabilitation, what is the result?
6. Do the symptoms change from the beginning?
7. Pain: nature, intensity and dynamics.
8. Concomitant diseases - additional complaints and possible complications implementation of rehabilitation measures.
9. Factors associated with daily activities.

OBJECTIVE ASSESSMENT OF THE PATIENT'S CONDITION. PLANNING REHABILITATION PROCESS

General provisions. Basic methods of objective evaluation.

Based on the examination plan drawn up after the patient's interview the rehabilitologist begins an objective examination. It is necessary to inform the patient about the nature and purpose of the examination.

Rehabilitation specialist is looking for a reason causes patient complaints:

- pain, discomfort;
- limited mobility: loss range of motion (contracture), stiffness;
- muscle weakness and related functional disorders.

For an objective assessment it is necessary to use standard ones survey methods and approaches.

The main methods that can be used in the process rehabilitation examinations include

- examination (as part of a continuous observation);
- anthropometry;
- performance of active and passive movements;
- goniometry;
- joint play;
- manual muscle testing;
- isometric muscle tension;
- dynamometry;
- palpation;
- pain scale;
- functional tests.

The methods used by the rehabilitation specialist must be safe for patient: evaluate the response of various structures to the load, try provoke aggravation or occurrence of symptoms. If the test causes aggravation of symptoms, it is considered positive.

The concept of rehabilitation prognosis and rehabilitation program.

Rehabilitation prognosis - determining the level of the maximum possible improvement and the time needed to achieve it.

Positive outlook - when possible to restore, compensate, support, slow down the loss of functions by means and methods of physical rehabilitation.

If the rehabilitologist believes that the intervention will not give positive results, he discusses his findings with the attending physician and the patient and may suspend further rehabilitation.

If the rehabilitation prognosis is favorable - you can make rehabilitation program.

The main factors to consider when creating a program:

1. Stages of the healing process.
2. The course of the disease (pathogenesis, sanogenesis).
3. Previous level of functions (motor status).
4. Consequences of immobilization.
5. The speed of recovery of lost functions (age?).

Definition of short- and long-term rehabilitation tasks.

Long-term goals (LTG) are descriptive provisions the patient's functional abilities that he will have at the end of the period physical rehabilitation. *Short-term goals (STG)* are more of a description discrete activities that the patient will have to master in the course rehabilitation to achieve functional activity defined as LTG. There must be a clear progression of goals, which indicates that the achievement is successful the short-term goal provides the basis for successful achievement long-term goal.

Long-term goals - it takes more than 3 weeks to achieve. May coincide with general individual rehabilitation tasks for the patient.

Short-term goals (from a few days to 2-3 weeks) are "steps" in achieving long-term, are achieved in parallel and successively.

The patient's wishes must be taken into account when setting tasks.

The task must be coordinated with the patient, take him into account needs, wishes, priorities, level of motivation. Successful achievement short-term tasks - helps to increase motivation.

PHYSICAL REHABILITATION AT DIFFERENT STAGES OF HEALING. CONTROL IN PHYSICAL REHABILITATION

Selection of means of physical rehabilitation.

They should be taken into account when choosing methods and means of physical rehabilitation comparative efficiency, interaction, individual tolerability, as well as the level of mastery of the rehabilitologist of certain techniques.

Means of physical rehabilitation are divided into:

– active;

– passive.

Active - physical exercises - the main means of physical rehabilitation.

Choosing between passive and active methods to prefer last.

Active physical exercises are used according to general didactic and specific principles of physical education.

Passive means and methods are mostly auxiliary, with the exception of inflammatory ones get up. These include:

- position therapy;
- physiotherapy;
- manual therapy (massage, joint play);
- passive exercises.

Passive means promote effective use of physical exercises - reduce pain, promote healing, normalize muscle tone. Passive exercise is used when the patient is not can perform any type of active exercise. Performing a passive exercise can also be used to overcome the negative consequences immobilization to assess the degree of mobility and flexibility in the joint to provide stimulation of sensitivity and to reduce stress on cardiovascular and respiratory systems. They can help save or maintaining the existing range of motion in the joint; they can minimize the development of contractures or capsular, ligamentous or tendon adhesions resulting from immobilization; they are, after all, can help maintain muscle elasticity. Passive means cannot prevent muscle atrophy, maintain or increase muscle tone or strength or endurance.

Means of physical rehabilitation can be aimed at:

- to reduce pain;
- restoration of amplitude;
- restoration of strength qualities;
- restoration of lost functions.

In addition to the symptoms, be sure to consider the symptoms the cause of their occurrence and the course of healing of damaged tissues.

Features of rehabilitation at the stages of inflammation, fibroplastic and remodeling.

Inflammation is a pathological process that most often occurs in the human body. Inflammation can occur as a response of tissues to the appearance signs of damage to cells or their components. This is important and complex the process is the result of evolution and was formed as a defense mechanism organism. The main task of inflammation is the localization of the pathological focus, removal (elimination) of the pathogenic agent and restoration of normal function cells, tissues, organs.

Inflammation is a typical pathological process occurs in response to tissue damage and consists of three interrelated vascular-tissue components:

- alteration;
- disturbance microcirculation with exudation emigration of leukocytes;
- proliferation.

Tissues and the circulatory system are involved in the implementation of the inflammatory process channel that determines the formation of classical local signs of inflammation, which in were once described by Celsus and Galen.

The main local features inflammation is tumor, rubor, color, dolor, functio laesa.

Swelling is a consequence exudation, redness occurs as a result of arterial hyperemia, fever (local fever) is caused by arterial hyperemia and short-term activation of metabolism at the center of inflammation (so-called "Exchange fire"), pain is caused by irritation of pain receptors mediators of inflammation, their compression by exudate and toxic action metabolites, such as organic acids.

Inflammatory phase is designed to clean damaged tissues, accompanied by edema, which creates favorable conditions for the conversion of fibrocytes to fibroblasts. Due to the selection platelets of vasoactive substances develop local acidosis, on the background which intensifies the reactions of catabolism.

Later in the wound is the release of leukocytes, T-lymphocytes and other cells whose main function is phagocytosis of bacteria. A similar phenomenon manifested in the secretion of manure. If the wound is festering, it indicates large accumulation of microorganisms in the wound.

This is followed by granulation or proliferative stage. A similar name this stage is given due to the fact that there is cell proliferation elements,

revascularization (ie the formation of new vessels), filling defect damage to new tissue. Granulation is temporary tissue, in the performance of its functions is subject to regression and is replaced scar tissue. The morphological basis of such tissue is glomeruli of newly formed vessels. If the process takes place in full and to the extent necessary, the growing tissue envelops these vessels, thereby increasing in volume. Externally, the granulations have a delicate color pink color.

Particularly indispensable in this process are the fibroblasts that provide collagen insertion, after reaching the edges of the wound. Therefore, if available hematoma, necrotic tissue, large accumulation of exudate processes the movement of fibroblasts is significantly slowed, as well as capillary formation.

The formation of collagen by fibroblasts occurs on the second day and the greatest activity is found on the 6th day of wound healing. Actually, a process granulation lasts up to 3 weeks, during which time the granulation tissue (which is already on it moment represented by connective tissue) matures.

Of particular importance is the sufficient content of cytokines in the wound defect, oxygen, iron, vitamin C, zinc. When the ripening process coming to an end, there is epithelial lining on top defect.

The last stage of differentiation characterized by education scar. This process begins at the edges of the wound and moves to its center parts.

For normal wound healing and the remodeling stage (maturation) requires a balance between the processes of decomposition and synthesis of collagen.

This stage can last for months or even years for large wounds heal by secondary tension. The strength of the wound increases over time as initially disorganized collagen type III is formed destroyed by matrix metalloproteinases and gradually replaced by type I collagen.

Formation and orientation parallel to the tension lines of type I collagen increases the strength of the wound. This process is the fastest in the first six weeks with a subsequent slowdown and lasts more than a year. By the third month, the strength limit of the wound reaches 50% of the strength limit normal skin and stabilizes at 80% by the end of the stage remodeling, despite the slow flow of the process for several years. The increase in the tensile strength is due to the formation of collagen mesh structures from the moment the increase ceases after the third week collagen content in the wound.

The initial scar is purple-red due to the huge the number of capillaries gradually turns white as a result of capillary absorption and their replacement by type I collagen. The end result of wound healing is formation of a dense, avascular, unstable scar.

Control in physical rehabilitation.

Methods of studying the effectiveness of the rehabilitation process depend on the nature of the disease, surgery, injury. There are the following types of control: operational, current and stage control.

Operational is used to assess the effectiveness of one lesson (urgent effect). To do this, study the direct reaction of the patient to physical activity using different methods.

Current control is carried out during the entire rehabilitation period less than once every 7-10 days, as well as when changing the motor mode. He gives opportunity to make timely adjustments to the methodology of classes, the program physical rehabilitation. Use clinical data, results functional tests, indicators of medical and biological research methods, anthropometry.

Stage control is carried out to assess the course of rehabilitation in general (cumulative effect).

Grounds for unscheduled evaluation.

- lack of improvement;
- deterioration of functional status;
- emergence of new symptoms.

The results of the assessment of changes in health and functional status were obtained states are considered in terms of performing predefined tasks rehabilitation and satisfaction of the patient with the achieved successes. Positive the assessment is the basis for continuing the implementation of the planned rehabilitation programs until its full implementation.

PHYSICAL REHABILITATION FOR PAIN SYNDROME. PHYSICAL REHABILITATION IN LOSS OF MOVEMENT AMPLITUDE. PHYSICAL REHABILITATION IN LOSS OF POWER QUALITY

Pain scale. Features of the use of fixed assets and methods of reducing pain.

If the patient complains of pain - fill in the pain scale.

One of the most common is the scale (VAS), which allows observe the intensity and dynamics of pain, make these indicators more objective.

Visual-analog scale of pain (VAS) - 10-centimeter scale, on which 10 corresponds to the maximum severity of pain, 0 - no pain.

There are also the following gradations of pain:

- 2 points (or 2 cm) - moderate pain;
- 4 points - moderate pain;
- 6 points - severe pain;
- 8 points - very severe pain;
- 10 points - maximum pain.

The scale of pain is individual. You can not compare the intensity pain on VAS in different patients.

There are also complex scales that allow you to evaluate not only intensity of pain, but also their nature, color, as well to predict the mechanism of their occurrence.

The main methods of physical rehabilitation are aimed at reducing pain:

- position treatment (unloading positions, lifting);
- physiotherapy (cryotherapy);
- massage; PIR;
- joint play;
- active and passive exercises.

Unloading positions - in which the damaged structure is subjected the smallest load (pressure, tension), often – loose position of the joints. Use rolls, tires, pillows.

Cryotherapy - to reduce inflammatory muscle and joint pain origin. An ice bag or gel bag should be applied through wet cloth for 10-15 minutes. with repetition in an hour - time depends on depth of damage and structure of the patient's body.

You can apply ice massage, nitrogen cooling or chloroethyl. Massage is used for lymphatic drainage in the inflammatory stage. At the stage remodeling - you can massage the damaged area.

First, the affected muscle is stretched along its length as much possibly due to the fact that stretching causes muscle pain and spasm. Then the muscle is forced to work in isometric mode, ie no changing its length, for which the rehabilitation hand prevents the implementation of the corresponding movement, which, according to the instructions of the patient tries to perform with relatively little effort for about 6-7 sec. The effect increases if the patient inhales at the same time as the manipulation, Then relax and exhale slowly. After that, how as a rule, the muscle without resistance can be stretched further. This is how a new extreme is achieved position. The relaxation phase is used as long as the muscle allows stretch it. Perform 7-10 years per session.

Perform so as not to aggravate the pain (from a painless point amplitude). Coordinate with breathing.

To reduce joint pain, use joint play. Exercise (active, passive) - to reduce muscle and joint pain.

Oscillatory movements with a frequency of 2-3 movements per second (depends on size joints).

Recently, widely used suspension therapy – for unloading joints and facilitating exercise.

Classification and diagnosis of contractures. Specifics application of fixed assets and methods of restoring the amplitude of movement.

Contracture - limitation of the normal range of motion in the joint. Yes the restriction is mainly due to mechanical interference within the joint (capsule, articular surfaces), or periarticular pathological changes in the skin, fascia, ligaments, muscles, tendons.

Joint rigidity - the presence of minor movements in the joint (3-5 °).

Ankylosis - complete lack of movement in the joint, fibrous – fibrous splicing of articular surfaces; bone - bone fusion.

Diagnosis of contractures is performed by a physician on the basis of medical history, clinical and radiological data.

Several classifications are offered in the modern medical literature contractures. In particular, there is a classification in the direction of physiological movements:

- leading;
- diverting;

- bending;
- extensor;
- supination;
- pronation;
- rotary.

Contractures can be mixed.

Congenital and acquired contractures are considered by origin.

Acquired contractures divided into

– post-traumatic,
– post-burn,
– post-immobilization,
– antalgesics.

Acquired contractures are the most common injuries (intra-articular fractures, ligament and capsule damage), inflammatory and dystrophic processes in the joint, prolonged immobilization, surgical interventions on the joints, lesions of adjacent tissues.

For a rehabilitation specialist who compiles and implements physical programs rehabilitation, it is important to obtain accurate initial information from the physician structure that causes restriction of movement.

Classification of contractures:

- myogenic - due to muscle tissue damage - muscle shortening due to congenital or acquired pathology;
- arthrogenic - due to joint damage;
- dermatogenic - due to scarring of the skin after surgery or wounds;
- desmogenic - due to scarring of ligaments, fascia, aponeurosis after operations or wounds;
- tendogenic - due to shortening of the tendon or its fusion with vagina after injury or tendosynovitis;
- neurogenic - due to disorders of the nervous system.

Methods of restoring the amplitude of movement:

- physiotherapy (ultrasound, thermotherapy - heat treatment);
- massage;
- joint play;
- postisometric relaxation;
- active and passive exercises.

The choice of method of restoring the amplitude of motion depends on the structure, which causes restrictions.

First of all - diagnosis of contracture, detection of limiting structure, and only then - the restoration of mobility.

Thermotherapy - promotes muscle relaxation (helps to restore length antagonists); improving the mobility of the binder. Used for elimination of myogenic, arthrogenic, desmogenic, dermatogenic contractures.

For thermotherapy use gel pillows (t 70-80 ° C), which should be apply through a rough wet towel for 20-30 minutes; baths for extremities (38-40 °); ozokerite; hot water bottle.

Massage - relaxes muscles, improves capsule mobility, ligaments, periarticular tissues. To eliminate all types of contractures (does not affect on the articular surface).

To eliminate arthrogenic, desmogenic, dermatogenic contractures joint game is also used.

To eliminate myogenic contractures should be used. For elimination of all types of contractures must be active and passive exercises.

Features of recovery of strength qualities in physical rehabilitation. Basic means and methods of restoring strength qualities.

Strength is lost due to decreased motor activity (hypodynamia), immobilization, damage to the MSA and nervous system. It causes disturbances in the neurological component of muscle strength and atrophy.

Features of power recovery:

- strength is restored faster if the initial level at recovery is low (lower level - faster recovery);
- the growth of strength is relatively fast by 25%, then - slowly (in trained - very slowly);
- the growth of strength is relatively rapid during the first 12 weeks of training, then slows down.

The main means of training - exercises with weights (dumbbells, barbells, body weight, simulators, spring expanders, rubber harnesses, counteracting the other persons) (other means of rehabilitation are ancillary). We use the maximum number of repetitions with a load of 65 to 100% of maximum (without fatigue there is no training - the last repetitions most important).

The strength of individual muscles or muscle groups can be assessed using manual muscle testing (MMT). Testing is performed according to the six-point Lovett scale:

- 0 points - no signs of stress when trying to move freely;
- 1 point - a feeling of muscle tension when trying to move freely;

- 2 points - performance of the movement in full in the conditions of exclusion of gravity of the segment under test;
- 3 points - performance of the movement in full under the conditions of gravity of the segment under test;
- 4 points - performance of the movement in full under the conditions of gravity of the segment under test and moderate resistance;
- 5 points - full performance in the conditions of gravity, tested with maximum resistance. The technique of manual muscle testing involves for each muscle or muscle group to determine the specific movement - "test movement".

In rehabilitation there is a problem with how to train very weak muscles score 1 and 2 according to MMT. To do this, use a reflex reaction stretching muscles, yielding exercises with the help of (eccentric type tension):

To restore muscle strength with a score of 3 apply yielding exercises, overcoming exercises with help

To restore muscle strength with a score of 4 use static exercises (isometric tension), overcoming exercises, giving way to exercises.

When reaching 70-80% of normal (on the undamaged side) force - it is advisable to start strength training.

When choosing a method of changing the load to increase the force should be take into account a number of factors:

The method of gradually increasing the load involves changing load from one cycle to another due to:

- weight gain;
- speed;
- shoulder length.

When training strength, you need to consider not only the size load but also on how the movement changes in its amplitude. At using the external load load the weight it uses the person remains constant and acts vertically downwards. But when using some simulators can change the shoulder action while maintaining a constant encumbrance.

Thus when using a normal weight load remains constant throughout the amplitude of motion, whereas at he use of simulators torque varies accordingly the load changes during the whole amplitude of movements.

When analyzing motion, it is important that the maximum torque is mostly appears around the middle of the range of motion. In accordance variable load simulators provide a change in load in a certain range of motion depending on the torque of the muscle.

PHYSICAL REHABILITATION FOR JOINT DISEASES

The disease of the joints is characterized by severe subjective and objective symptoms, among which the main ones are pain, dysfunction, significant limitation of physical capabilities of patients, which leads to a decrease in their ability to work and often to disability. Diseases of the joints are divided into two main groups: inflammatory - arthritis and degenerative - arthrosis.

Arthritis and arthrosis can be both primary, independent diseases, and secondary manifestations of diseases of other organs and systems. The pathological process can develop in one joint (monoarthritis) or in several (polyarthritis), as well as localized in the spine.

Diseases of the joints are treated complexly. Physical rehabilitation is widely used together with medical treatment, diet therapy, orthopedic methods, and sometimes surgical interventions.

Clinical and physiological justification for the use of physical rehabilitation

Therapeutic physical training for diseases of the joints is used at all stages of rehabilitation of patients. The therapeutic effect of exercise is manifested, first of all, trophic and tonic effect on the body, and later - the formation of compensations and normalization of functions.

Exercise increases the overall tone and functional state of the body, which often reduces patients not so much from the disease itself, but from a significant limitation of their mobility and related to hypodynamic functional changes in the CNS, cardiovascular, respiratory and other systems. Exercise therapy has a positive effect on the patient's psycho-emotional state and maintains hope for a favorable outcome of treatment.

Exercise therapy prevents complications arising from joint disease (osteoporosis, atrophy of muscles and cartilage, contractures), prevents their progression. Repeated repetitions of movements form a joint, restore and preserve its congruence and function, strengthen the musculoskeletal system, maximally support its function.

Exercise enhances general and local blood and lymph circulation, transport of oxygen and nutrients through the blood and excretion of metabolic products. Local

improvement of trophism contributes to the attenuation of inflammatory changes, resorption of edematous fluid in the joint and around the joint tissues, acceleration of their regenerative and inhibition of degenerative processes.

Exercise therapy provides the formation of temporary compensation, and in the future - the normalization of joint function. At irreversible changes in it physical exercises promote formation of constant compensations. Exercise classes train the body and prepare the patient for domestic and industrial activities.

Therapeutic massage is used in hospital and post-hospital rehabilitation periods. Its therapeutic effect is manifested mainly due to neuro-reflex and mechanical mechanisms.

Massage has a positive effect on the functions of the CNS, improves the mood and well-being of the patient. It reduces pain, prevents the irradiation of pain from diseased joints, reflexively equalizes muscle tone, which decreases due to the disease.

Massage prevents or reduces muscle atrophy, stretches them and increases contractility; counteracts connective tissue adhesions, the emergence of contractures, violation of the axis of the limb. This reduces the possibility of redistribution of the load on the working surfaces of articular cartilage and protects them from further trauma, inflammation, growth of exostoses, progression of deforming osteoarthritis and arthritis.

Massage improves blood supply to joints and surrounding tissues, stimulates the formation and circulation of synovial fluid, activates redox and metabolic processes. This promotes the resorption of inflammatory fluid, elimination of edema, intensification of regeneration processes; inhibits the development of degenerative processes in cartilage and joint bag, ligaments of joints; supports and restores their functions.

Physiotherapy is used at all stages of rehabilitation. The main mechanisms of therapeutic action of physical methods in diseases of the joints are neuro-reflex and humoral.

Physiotherapeutic methods of treatment balance the course of the main nervous processes in the CNS, have a positive effect on the sympathetic-adrenal and endocrine systems, immunological processes; act as an analgesic, anti-inflammatory, hyposensitizing; increase the overall functional state of the body.

Physiotherapy activates the general and local blood circulation, improves micro-circulation in joint tissues, promotes the growth and normal functioning of synovial villi, which secrete synovial fluid. All this improves redox and trophic processes in the joints, eliminates edema, reduces destructive phenomena in the epiphyseal cartilage, helps to preserve their function.

Physiotherapeutic methods reduce the activity of the pathological process, inhibit its development, reduce inflammation in the joints, promote longer remission. They increase the effectiveness of drug treatment, which allows to reduce their dosage and, thus, reduce the side effects of drugs.

Mechanotherapy is used in the final stages of rehabilitation. It acts directly on the affected joint, increases blood and lymph circulation, reduces edema, activates the circulation of synovial fluid. Mechanotherapy increases the amplitude of movements, stretches and improves muscle elasticity and ligaments, helps to restore muscle strength and joint function.

Occupational therapy is used mainly in the post-hospital rehabilitation period. It has a positive psychotherapeutic effect, mobilizes the will and directs to productive activities. Occupational therapy restores or increases mobility in the joints and muscle strength, improves coordination of movements, promotes the development of temporary compensation, and if necessary - develops permanent.

ARTHRITIS

Arthritis is an inflammatory disease of the joints. The cause is a non-specific or specific infection. The first leads to the development of infectious nonspecific rheumatoid and rheumatoid arthritis, ankylosing spondylitis - ankylosing spondylitis. Specific inflammatory diseases of the joints are caused by tuberculosis, syphilitic, gonorrheal, brucellosis and other infections.

In arthritis, regardless of the cause, the inflammatory process first affects the synovial membrane, then spreads to the capsule and the tissues surrounding the joint. There is an increased secretion of synovial fluid, which causes swelling of the joint and limited movement. At transition of a disease to a chronic form overgrowth of a joint and its full immobility (ankylosis) is possible. Local changes in the joints are accompanied by disorders of the general condition, decreased tone, weakness, fatigue, loss of appetite, weight loss. The clinical course of arthritis can have acute, subacute and chronic stages.

Infectious nonspecific rheumatoid arthritis is a common disease of the joints, characterized by multiple symmetrical lesions first of the joints of the hands, wrists and feet, then of the knees and elbows. Polyarthritis is very prone to progression and recurrence of the process. Patients have pain, swelling, crunch and deformity of the joints, limited movement in the form of temporary stiffness, painful contractures, muscle atrophy, fever during exacerbations. Subsequent recurrences of the disease lead to significant deformation of the joints, flexion contractures, ankylosis, especially in rapidly progressive course of polyarthritis (1-2 years). In cases of slow development of the disease, these symptoms increase gradually over decades.

Rheumatic arthritis is one of the manifestations of rheumatism, the main changes of which occur in the heart. In this pathology, the knee and ankle joints swell, there is pain and restriction of movement, the temperature rises. Unlike others arthritis, changes in cartilage and bone are not observed. A characteristic feature of rheumatoid arthritis is disappearance of all joint manifestations under the influence of complex treatment.

Ankylosing spondylitis or Bekhterev's disease is a chronic progressive disease in which there is a gradual ankylosing spondylitis, which leads to complete loss of mobility. This leads to limited excursion of the chest and respiratory disorders. The shoulder and hip joints are involved in the process, thus complicating the patient's motor ability. The main symptoms of the disease are pain in the lower back and buttocks, and when the process spreads, they occur in the spine, radiate to

different parts of the torso. At patients atrophy of muscles of a back, buttocks, a breast is noted, the general weakness, fast fatigue is observed. The disease progresses with periodic exacerbations and remissions lasting from several months to several years.

The most severe specific inflammatory diseases of the joints, leading to disability of patients, include tuberculous arthritis. Most often it is localized in the spine or in one of the large joints. During the development of the process there is pain in the affected joint, which is accompanied by reflex muscle contracture and limitation of its function. Lameness, atrophy of muscles of an extremity and a back, the phenomena of the general intoxication, increase in temperature are noted. Further progression of the disease leads to deformity of the joint, purulent cartilage dissection, shortening of the limb. In cases of spinal lesions during this period of the disease there is destruction and deformation of the vertebral bodies and the appearance of a hump, and sometimes spinal disorders. This active process lasts for several years and then subsides, but the deformities of the joints, their dysfunction, and even ankylosis remain forever.

Arthritis is treated complexly. Prescribe anti-inflammatory, analgesic, hormonal, vitamin and other drugs, diet therapy with reduced fluid and salt; use orthopedic methods, means of physical rehabilitation.

The hospital rehabilitation period includes:

- exercise therapy;
- therapeutic massage;
- physiotherapy;
- occupational therapy.

Therapeutic physical training is prescribed after the attenuation of acute manifestations of arthritis and the transition of the disease to the subacute phase during bed rest. its task: to increase the tone of the CNS and create confidence in the patient's favorable outcome of treatment; activation of the cardiovascular and respiratory systems; improving general and local hemodynamics, trophic and regenerative processes in joints and surrounding tissues, reducing their edema; prevention of contractures and defects, destruction of defective temporary compensations; gradual restoration of the function of the affected joints.

Exercise therapy is used in the form of therapeutic and morning hygienic gymnastics, independent classes several times a day. The complexes consist of simple general developmental, respiratory static and dynamic exercises and special exercises to relax the muscles adjacent to the affected joints. Movements in them

begin with passive, then active, performed with the help of others and, finally, active, performed independently. Exercises are performed in light conditions (sliding surfaces, roller carts, etc.) at a slow pace on all axes, with the fullest possible amplitude. At the same time, it is necessary to avoid strengthening of pain as reflexively increases muscle tension and decreases the amplitude of movement. Duration of classes in therapeutic gymnastics - 10-15 minutes.

In the semi-bed mode, exercises with objects, small weights and resistance, joint exercises with the inclusion of affected and symmetrical healthy joints, swinging movements are introduced. Use relaxation exercises, applied, as well as those that, if necessary, form compensatory movements instead of sharply disturbed or lost. The duration of classes in therapeutic gymnastics is 25-30 minutes. Independent classes are held 8-10 times a day for 5-8 minutes.

Free motor mode involves the use of general developmental exercises for all muscle groups, performed from different starting positions. Apply breathing and special exercises for the affected joints of the subject-we, on the devices, in relaxation, swinging. Mandatory component of classes are exercises of domestic and professional nature. Classes include difficult walking with the crossing of objects of different heights and volumes, exercises for coordination of movements and the development of musculoskeletal sensations, elements of sports games. Exercises in water are recommended. The duration of therapeutic gymnastics classes is 30-35 minutes. They continue to repeat independent classes many times during the day.

Therapeutic massage is used simultaneously with exercise therapy to reduce pain, rigidity and muscle atrophy, counteract the development of contractures, improve blood supply and trophic processes, resorption of edema in the joint and surrounding tissues, preparation of muscles for special physical exercises. Massage the muscles of the affected limb, using stroking, rubbing and kneading of low intensity. Massage is applied before the start of therapeutic gymnastics classes and in the process of its implementation is combined with passive and active-passive exercises.

Physiotherapy is prescribed earlier than all other means of physical rehabilitation for anti-inflammatory, analgesic effect on the joints, hyposensitizing effect; activation of adrenal glands, immunological processes; improving microcirculation and tissue trophism, reducing their edema; restoration and preservation of joint function. In the acute phase of the disease, UV, Solux, light bath, electrophoresis of drugs, diadynamotherapy, inductothermy and ultrasound of the adrenal glands are used. After the acute manifestations of the disease subside,

microwave therapy, magnetic therapy, ultrasound and inductothermy are added to the joints.

Occupational therapy begins in a semi-bed mode in order to activate the affected areas of the musculoskeletal system and maintain work skills. They use self-care techniques, simple work (writing, drawing, making gauze tampons, envelopes, twisting bandages, knitting, assembling and developing toys, etc.).

In the post-hospital rehabilitation period apply:

- exercise therapy;
- therapeutic massage;
- physiotherapy;
- mechanotherapy;
- occupational therapy.

Therapeutic physical training has the following tasks: restoration of the normal mechanism of movements in the affected joints or stabilization of permanent compensations; increase of strength and endurance of muscles, general strengthening of an organism; stimulation of the cardiovascular and respiratory systems; improvement and maintenance of physical fitness of patients and adaptation to domestic and industrial loads.

The basis of complexes of therapeutic gymnastics and independent classes are special exercises that ensure maximum preservation of joint functions or the formation and maintenance of stable compensation. Use active movements in each joint, swinging movements with and without weights, exercises to strengthen weak muscles and stretching the musculoskeletal system of the affected joints. When performing the latter, you cannot allow the appearance of significant pain, because there are reflex muscle tension and reduced range of motion in the joints. Complexes saturate with general developmental, respiratory and relaxation exercises. Recommend hydrokinesitherapy, walking, moving games, health trips, walks.

Therapeutic massage is used to improve the functions of the joints, stretch their musculoskeletal system, strengthen the contractile ability of muscles, prevent the development of connective tissue adhesions and muscle atrophy.

When the joints of the upper extremities are affected, the paravertebral zones of the spinal segments D7-Dl, C7- C3, back muscles, deltoids, large chest and sick hands are massaged using stroking, rubbing, kneading and vibration. When massaging the affected joint, use stroking, rubbing its entire surface and make longitudinal fingertips and forceps stroking, circular rubbing, hatching, continuous

vibration with fingertips and palm. Tendon attachment sites, joint bags are massaged thoroughly. Massage is combined with active and passive movements of the diseased limb.

When the joints of the lower extremities are affected, the paravertebral zones of the spinal segments S5-SI, L5-LI, D12-D11, the muscles of the buttocks, the patient's leg and the affected joints are massaged. In addition to segmental-reflex and classical massage, hydromassage is also recommended.

Physiotherapy is prescribed to counteract the activation of the inflammatory process and prolong the remission period of the disease; preservation of movements in the affected joints and maintaining the functions of the musculoskeletal system; elimination of the center of chronic infection; normalization of neurohumoral regulation and immunological nonspecific reactivity of the organism; stimulation of protective and compensatory processes, general strengthening and hardening of the body. They use ultrasound, microwave therapy, inductothermy of the adrenal glands, electrosleep, radon, nitrogen and sage baths, mud therapy, paraffin-ozokerite applications, general and local douching, wet wrapping, rain shower, bathing, climatology.

Mechanotherapy is used to counteract stiffness in the joints, eliminate contractures and restore the amplitude of movements in the affected joints; stimulation of synovial fluid circulation, development of muscle strength and endurance. Use devices of pendulum and block types. The load should be increased carefully, do not force it, allowing slight pain when moving. To reduce pain and prepare the affected joints for mechanotherapy, it is recommended to perform thermal procedures before it.

Occupational therapy is recommended to maintain movements in the affected joints, to restore and maintain general physical performance and work skills, or to develop new ones and adapt them to everyday life. Use work on printing, manual and foot sewing machines, knitting, carpentry and metalwork, in the garden, in the backyard, etc.

The program of physical rehabilitation for ankylosing spondylitis due to the gradual ankylosing of the joints of the spine has its own characteristics. In addition to the tasks of exercise therapy for arthritis, the following are added: improving mobility in the affected joints of the spine, preservation and compensatory development of movements in non-damaged parts of the spine; strengthening the muscles of the back and shoulder girdle, respiratory muscles; improving the function of external respiration. The peculiarity of the technique, which arises due to static-dynamic changes in the spine, is the performance of movements from

unloading starting positions (lying down, standing on your knees) and the exclusion of exercises related to shocks and shaking of the spine. At sharp restriction of mobility in hip and shoulder joints during occupations patients are taught skills of movement and self-care, and at ankylosis of costal and vertebral joints - development of compensatory diaphragmatic breath. Extensions in a vertical bath with the weight of own body, lying on a firm bed on a back without a pillow are shown. Massage of the back, chest, limbs, neck; electrothermal treatment of the affected areas of the spine, apply restorative methods of physiotherapy.

Treatment of tuberculous arthritis with exercise therapy is carried out in three periods. It has its own peculiarities, which arise from the forced rest of the affected musculoskeletal system lasting up to 2-3 years. In the active stage of the disease, the main task of physical exercises of the first period is to reduce the negative manifestations of hypokinesia on the body. To do this, use general developmental exercises for healthy areas of the body, repeated several times a day. In the second period the task is to eliminate the consequences of prolonged rest and prepare the patient for walking. Use a variety of exercises for all parts of the body, except for the affected joint, exercises for coordination and balance and those that prepare the patient to use crutches. In the III period, if there is no ankylosis, you can carefully perform special exercises for the affected joint and prepare the patient for the burdens of domestic and labor nature. Among the physiotherapeutic methods of treatment used: calcium electrophoresis, general UV, electrical stimulation of the muscles of the lower extremities, daily wiping with salt water, if possible, around the clock in the fresh air.

ARTHROSIS

Arthrosis is a degenerative-dystrophic disease of the joints, in which there are changes in the articular cartilage with subsequent bone growths. This leads to deformation of the articular ends of the bones, restriction of movement, tendon-muscle contractures. The disease mainly affects the joints of the lower extremities and spine in the form of intervertebral osteochondrosis.

The main cause of primary deforming arthrosis is damage to the articular cartilage during systematic prolonged overload of the joints, their constant microtrauma. This is most common in manual workers and athletes. The joints that are most stressed during work or sports are affected: knee joints - in loaders, weightlifters, football players, skiers, wrestlers; elbow - for workers with pneumatic hammers, tennis players, fencers, gymnasts, archers; lumbar spine - gymnasts, wrestlers, divers and ski jumpers, rowers, etc.

Arthrosis develops slowly, gradually, unnoticed. The first signs of the disease are a feeling of discomfort in the joint, stiffness after rest, which disappears during movement, weakness and rapid fatigue of the surrounding muscles, joint pain after heavy exercise. Over time, there is a rough crunch, accompanied by increased pain, muscle atrophy, effusion, deformity of the joint and limited movement in it.

Osteochondrosis of the spine - degenerative-dystrophic changes of the intervertebral discs with subsequent lesions of the adjacent vertebrae, intervertebral joints and ligaments. The most frequently affected are the intervertebral discs, the lower lumbar and lower cervical. Initially, osteochondrosis of the spine is manifested by rapid fatigue of the back muscles, pain with prolonged static load. The development of the disease is accompanied by increasing local pain in the affected disc, neuralgic disorders, protective muscle tension, limiting the mobility of the spine.

Normally, the disk performs primarily depreciation functions. It consists of a fibrous ring, in the center of which is a gelatinous (pulpal) nucleus, from the upper and lower cartilaginous plates. The disease causes degenerative changes in the gelatinous nucleus and replacement of its affected areas with fibrous connective tissue. The disk loses turgor, flattens, cracks appear. Inferiority of the disc leads to convergence of the vertebrae, narrowing of the intervertebral spaces, friction against each other, trauma to the cartilage and vertebral bones, bone growth at its edges, which disrupts blood and lymph circulation, causes edema, can compress the spinal nerves (sciatica) and blood vessels.

When lifting weights, sudden movements and other physical activities, accompanied by an increase in intradiscal pressure, there may be a tear and crack in the fibrous ring, through which fragments of the precious nucleus protrude - the so-called disc herniation. It compresses the nerve roots, blood vessels or part of the spinal cord and clinically manifests itself in sudden back pain in the form of a shot (lumbago) in the leg, arm, intercostal space. Due to the sharp pain, the patient cannot cough, sneeze, talk loudly and, moreover, move. When the vertebral ligament is involved in the process, mobility occurs that is not characteristic of the vertebral segment, ie displacement of the vertebrae, which, in turn, aggravates the course of osteochondrosis. The disease causes constant tension of some muscles of the spine and atrophy of others, motor and trophic disorders, postural disorders up to scoliosis.

When the cervical spine is affected, patients develop aching, squeezing, tearing, burning pain in the back and sides of the neck, nape, shoulders. It spreads to the arm and can cause heart pain that mimics angina and forces the patient to see a cardiologist. Sometimes the nature of the pain when the middle thoracic discs are affected resembles the pain of gastritis or duodenal ulcer. Patients with osteochondrosis of the cervical spine often complain of headache, irritability, depression, numbness of the hands at night, forcing them to get up and knead the muscles of the limb.

In lumbosacral osteochondrosis, patients complain of pain, burning and shins in the lower back, pain in the sciatic nerve, numbness of the legs, chills, cramps in the calf muscles, and others. Progression of the disease entails significant muscle atrophy and in severe cases there is paralysis of individual muscles of the limb, which impedes movement, impaired gait.

The clinical picture of arthrosis is characterized by a chronic course of the disease with periodic exacerbations and remissions. The duration of the acute period and its severity depend on the localization of the process, anatomical changes at the site of lesion, concomitant pathology and the causes of the disease. The clinical course of secondary arthrosis, which arose after some arthritis, intra-articular fractures, ruptures of the ligaments and as a result of hormonal disorders and metabolism, is more complex.

Treatment of arthrosis is complex and consists mainly of the use of drugs that reduce pain and reduce muscle tension, orthopedic methods, diet therapy, physical rehabilitation, chiropractic.

Hospital rehabilitation period. Patients in the acute period of the disease are usually hospitalized and prescribed bed or semi-bed rest. During this period, use the following means of physical rehabilitation:

- exercise therapy;
- therapeutic massage;
- physiotherapy.

Therapeutic physical training is prescribed during the exacerbation of osteoarthritis and during its subacute course. According to these features of the disease, exercise therapy is used in two periods.

Goals of exercise therapy in the first period in deforming arthrosis:

– unloading the affected joint, increasing the joint space, reducing pain;

– improving blood and lymph circulation, trophic processes in the affected joint;

– muscle relaxation, elimination of contractures and increase in the amplitude of movements;

– the formation of temporary compensations and increase the overall tone of the body.

Use therapeutic and morning hygienic gymnastics, independent classes 5-6 times a day, hydrokinesitherapy.

Unloading of the affected joint and reducing the mutual pressure of the articular surfaces reach the starting position during exercise, excluding the axial load on the limb. Therapeutic gymnastics is performed in a lying and sitting position and consists of general developmental, breathing, corrective and special exercises. The latter include passive, active with and without help exercises for the affected limb, performed in light conditions, swinging movements in diseased joints and relaxation. Exercises are performed at a slow pace and are limited by the amplitude that does not cause pain. It is best to exercise in warm water, which helps to eliminate spasm and muscle relaxation, eliminate reflex contractures, reduce pain and increase mobility in the affected joint. During the day, recommend passive changes in the bent and unbent position for the affected joint, you can do cuff extensions with a small load. Gradually the pain decreases and the amplitude of movements in the affected joint increases, the patient is prescribed a semi-bed rest and switch to exercise therapy for the II period.

In the II period the tasks of exercise therapy are supplemented. They are aimed at:

– reducing muscle atrophy, strengthening the musculoskeletal system of the affected joint, normalizing its function or the formation of permanent compensation;
– elimination of posture defects and general strengthening of the body.

Exercise therapy is supplemented by therapeutic walking and deforming arthrosis of the lower extremities is recommended first unload the leg from the weight of the body with crutches, and when allowed to walk without support, the patient's attention is drawn to the correct posture. Classes include exercises to restore motor skills, applied nature, with resistance and light weights, continue exercises in the water.

In osteochondrosis of the spine and the period of exercise therapy is carried out in the acute phase of the disease. At this time in the foreground there is pain and the associated incessant reflex-protective tension of the back muscles. Therefore, the tasks of exercise therapy are:

– unloading the affected area of the spine and increasing the distance between individual vertebrae, relaxing the muscles of the back and neck;
– reduction of pressure on the root of the spinal nerves and reduction of pain;
– improving blood and lymph circulation in the affected segments, prevention of adhesions; raising the overall tone of the body.

In the classes of therapeutic gymnastics in the localization of osteochondrosis in the cervical spine, the following methodological principles must be followed:

– in case of pathological mobility of the vertebral segments, classes should be conducted in a cotton gauze collar of the Schantz type, which fixes the cervical region;
– active movements in the cervical spine in acute and subacute periods are contraindicated, as they can lead to narrowing of the intervertebral foramina and compression of nerve and vascular formations; they are introduced in the final period and performed at a slow pace, without amplification and stress;
– all exercises should be alternated with relaxation exercises;
– from the first procedures enter exercises to strengthen the muscles of the neck in the form of 5-7-second resistance to bending the head, turn, keep it in a supine position, back, abdomen, side;
– to overcome the effects of analgesic posture and pain, which reduced the excursion of the chest, should include breathing exercises;

– do not allow the aggravation of pain during exercise.

Complexes of therapeutic gymnastics consist of exercises for small and medium muscle groups, relaxation of the muscles of the shoulder girdle and upper extremities, swinging movements with the hands. Exercises are performed in a supine and sitting position. As the pain subsides, exercises are introduced to strengthen the muscles of the shoulder girdle and upper extremities, which alternate with breathing and relaxation exercises. Use exercises for coordination, balance.

At localization of osteochondrosis in a lumbosacral part of a backbone, of course, to the patient carry out extraction of a backbone by various methods and in various conditions, apply manual therapy. The rehabilitator should help the patient find an analgesic posture and movements that help reduce muscle tension and reduce pain. He weakens in the position of the so-called " cocked trigger" - lying on his side with his legs bent at the hips. Brings relief to patients lying on their backs, legs bent at the hip and knee joints, and shins placed on a stand or soft roller.

Complexes of therapeutic gymnastics are built taking into account the anatomical and biomechanical features of the lumbosacral spine. First of all, this applies to the starting position, which depends on the intra-disc pressure in the affected area. It is proved that it rises almost twice in the vertical position. Therefore, during this period, all exercises are recommended to be performed in the initial positions that unload the spine - lying on your back, abdomen, side and standing on your knees. However, it must include exercises to relax the muscles of the torso and extremities, stretching the spine along its axis, which increases the intervertebral spaces and the diameter of the intervertebral foramina, reduces compression on nerve roots and surrounding vessels.

Naturally, contraindicated exercises for stretching the lumbar spine, tilting the torso forward by more than 15-20° - ("kyphosis" exercises), which increase the compression of the ligament, intradiscal pressure, displace the disc, stretch the tissues and m lumbar region. Completely exclude any other exercises that increase mobility in this department spine and thus further injure the degenerated disc and increase the irritation of the nerve root.

To stabilize the affected part of the spine, strengthen the muscles of the torso, pelvic girdle and limbs in the classes use physical exercises of a static nature, first with low exposure (2-3 s), and then with increasing. To reduce the likelihood of vertebral displacement and the associated exacerbation of osteochondrosis, it is recommended to fix the lumbar spine during training with a weightlifter's belt with

localization at the level of L5-S1, or orthopedic corset with osteochondrosis above this level.

Classes include exercises for the distal parts of the lower extremities, in the reference of impulses to movements, static and dynamic breathing exercises; to relax the muscles of the torso and limbs. Exercises are used to help open the posterior parts of the spine, where the roots of the spinal nerves are located. Such exercises are: pulling the bent legs to the abdomen in a supine position, etc .; bending the torso while standing on his knees Isometric muscle tension, lumbar pressure on the couch in a supine position, legs bent at the knees are recommended. They can be exacerbated by tension in the gluteal muscles and perineal muscles. These exercises increase the intra-abdominal pressure and thus reduce the intra-disc. All exercises are performed freely, without effort, sharp movements, at a slow pace, with a small number of repetitions, with pauses for rest, preventing fatigue of the muscles of the diseased limb and lumbar region.

In the II period, when inflammatory phenomena and pain in the affected segment are reduced and the general condition of the patient improves, exercise therapy has the following tasks: strengthening the muscles of the affected spine and torso; restoration of the correct anatomical and physiological positions of the affected segments; spinal mobility and posture skills; preparation of the patient for household and workloads.

Exercises are performed from the starting positions, unloading the spine. The starting position sitting with osteochondrosis of the lumbosacral region is excluded due to the increase in intradiscal pressure and standing - used minimally only to restore the skills of proper posture and walking training. Contraindicated sharp exercises and movements that shake the spine.

Strengthening the muscles of the torso is performed in a supine position, they can be complicated by light weights and resistance. Carefully perform rotational movements and extension of the spine, excluding forward bends. Be sure to use relaxation exercises both in this and in the following stages of treatment. When the patient's condition improves, therapeutic walking is prescribed, during which the patient must try to maintain proper posture. He is taught to walk without support, to step over objects, to walk up stairs. Hydro kinesitherapy is recommended.

Therapeutic massage is used to alleviate the acute manifestations of the disease to reduce pain; muscle relaxation, counteracting the development of contractures and muscle atrophy; improving blood and lymph circulation, trophic processes in the affected joints and surrounding tissues; psycho-emotional tone of

the patient. Segmental-reflex massage of the corresponding spinal segments and classical massage are used.

The method of therapeutic massage for deforming arthrosis is similar to that used for arthritis. At osteochondrosis paravertebral zones of spinal segments and reflexogenic zones of a thorax and a pelvic area are massaged; muscles of the back, buttocks; iliac crests, costal arches, intercostal spaces, spinous processes; hip and shoulder joints. Selective massage of painful areas and points of the chest is performed.

In case of significant pain, the massage should have a relaxing, gentle nature with the use of light stroking and rubbing, shallow kneading. At reduction of a pain syndrome they do more intensively, especially in places where there is a consolidation of muscles, apply additional receptions: planing, sawing, shift, shaking, patting. Massage is combined with passive, active with the help, and then active movements, shaking of the extremities.

Physiotherapy is prescribed in the acute period for analgesic, anti-inflammatory effects on the affected area; muscle relaxation and activation of blood and lymph circulation, redox and metabolic processes, elimination of tissue edema; counteraction to degenerative-dystrophic processes, preservation and restoration of joint function. Initially, phono- and electrophoresis of analgesics and hormonal drugs are used, and after the reduction of acute pain - UV, diadynamotherapy, microwave therapy, magnetic therapy, inductothermy, Solux.

In the post-hospital period of rehabilitation are used:

- exercise therapy,
- therapeutic massage,
- physiotherapy,
- mechanotherapy,
- occupational therapy.

Therapeutic physical culture in deforming arthrosis has the following tasks:

– restoration of joint function, prevention of pathological deformities or stabilization of permanent compensations;

– strengthening the muscles of the affected limb, the overall increase in muscle strength and endurance; improving the activity of organs and systems of the body, physical fitness of patients;

– adaptation to domestic and industrial loads, prevention of exacerbations of the disease.

Therapeutic and morning hygienic gymnastics, walking, walking, health training, moving games and in the early stages of osteoarthritis - sports games, swimming and water exercises are used. When selecting and performing physical exercises, first observe the rule of unloading the affected limb. Then the load on it should be gentle in nature, based on the fact that the process is not eliminated and the disease has entered remission.

In osteochondrosis of the spine, the tasks of exercise therapy are: strengthening the muscles of the neck, shoulder girdle, back, abdomen and the formation of the muscular corset; general increase in muscle strength and endurance; restoration and maintenance of basic static and biomechanical functions of the spine, normal physiological curves, correct posture; improving the activity of the cardiovascular and respiratory systems, physical performance and adaptation of patients to domestic and industrial loads; prevention of exacerbations of the disease. They recommend therapeutic and morning hygienic gymnastics, independent classes, breaststroke, backstroke, health training, skiing, walking, etc. Applied and sports asymmetric exercises are contraindicated, such as throwing, pushing a medball with one hand, discus throwing, as well as barbell exercises, rowing, etc. Abrupt, jerky movements, vibrations, leaning forward and lifting heavy objects in the "crane" position are not desirable.

Therapeutic gymnastics complexes include general developmental exercises, isometric exercises for the neck, shoulder girdle, torso muscles, lower extremities and dynamic exercises with weights, which should be performed from the starting position lying on your back. they alternate with breathing and relaxation exercises, combined with posture correction exercises.

Patients are recommended several times a day, especially when the work is associated with prolonged tilting of the head or sitting, change posture, rest, perform isometric muscle tension. With osteochondrosis of the cervical spine, you can use the following exercises: standing near the wall, press it with the back of the head for 3-5 seconds, followed by muscle relaxation; sitting at a table, lean your chin on your bent arms and press them, trying to tilt your head or turn it to the side, etc.

At a lumbosacral osteochondrosis recommend sitting on a chair, to press shoulders, a waist on a back of a chair; holding hands on the seat of the chair, try to lift yourself together with the chair; put your elbows on the table, pressed on it; standing, touching the back of the wall, alternately buttocks, waist, shoulders dosed

to press on it. After each exercise you should relax your muscles and take a break to rest. The number of isometric muscle tensions in one session is 4-5.

In general, in everyday life during domestic or industrial activities, rest and even sleep there are poses and movements that are harmful to patients with osteochondrosis. Such patients should not watch TV or read in a supine position with a high pillow under their head on a sofa with an arched spine. Not desirable stay in one position for a long time while working, driving a car or in transport, in such cases you should wear a neck-fixing collar, orthopedic corset, weightlifter's belt. The patient is recommended to: sleep on a firm bed on a small pillow, and for neck pain - it is better to sleep on your back without a pillow; in any work to strive to preserve the natural curves of the spine; use additional devices to perform work without damaging the spine.

Taking into account the above and the results of ergonomic studies of the most common production operations and actions in everyday life, the correct and incorrect body positions that a person should acquire during work and homework.

Inclined planes are often used to prevent and treat osteochondrosis and some other spinal diseases. In this position, under the weight of one's own body, unloading and extraction of segments of the vertebral trunk are achieved. This contributes to the increase of intervertebral spaces, reduction intradiscal pressure and compression of nerve roots and vessels, stretching and relaxation of tense muscles. Among such simulators the deserved recognition V.V. Evminov which represents the multilayered wooden plane capable to amortize has received the deserved recognition. Depending on the tasks, it can be installed at different angles, and the movable handles allow both adults and children to engage. The complex of physical exercises developed by the author, performed against the background of unloading the spine, helps to strengthen the deep and superficial muscles of the back, the formation of a muscular corset, which is the basis of normal functioning and protection of spinal structures. Ease of use of the prophylactic allows it to be used in treatment and prevention facilities, physical education classes, health groups, educational and training process and at home.

Therapeutic massage is used to reduce the tone of tense muscles and increase the contractile ability of the weakened; improving blood and lymph circulation, trophic and regenerative processes; elimination of neuralgic manifestations of osteochondrosis; maintaining the mobility of the spine and the patient's ability to work; continued remission of the disease. Segmental-reflex, classical massage is used and, in comparison with the previous period, it is performed longer and more

intensively, using all techniques. Prescribe hydromassage, acupressure and self-massage.

Physiotherapy is prescribed to improve microcirculation and trophic regenerative processes, the development of deep active hyperemia, inhibiting the development of degenerative-dystrophic changes, eliminating reflex muscle spasm and strengthening weakened muscles; increase of the general tone, hardening of an organism. Apply UV, diadynamotherapy, inductothermy, ultrasound, electrical stimulation, mud, paraffin-ozokerite applications, radon baths, salt-coniferous, sulfide, rain osteochondrosis, rain shower, climatotherapy.

Mechanotherapy is used to restore and maintain the achieved amplitude of movements in the joint, stretching and improving the elasticity of muscles and ligaments, restoring their strength and endurance, training of the cardiovascular and respiratory systems, maintaining general physical performance. Pendulum and block mechano-therapeutic devices, devices for water exercises are used.

Occupational therapy aims to develop and maintain movements in the affected joints and segments of the spine; restoration and preservation of work skills, mastering new skills and poses in the performance of household and professional work, recreation; maintenance of general physical fitness. Use types of work that do not create additional loads on the spine or affected joint.

Patients with rheumatoid arthritis, deforming arthrosis, osteochondrosis during remission are recommended to be periodically treated in balneological and mud resorts (Saki, Evpatoria, Khmelnytsky, Berdyansk, Odesa, etc.) with the use of climatotherapy and sea bathing.

The effectiveness of physical rehabilitation in diseases of the joints is determined, in addition to general clinical indicators, by increasing the amplitude of movements and restoring joint and spine function, muscle strength and endurance, coordination of movements, development of temporary and permanent compensation, restoration of functional state I physical capacity, work skills, ability of patients to domestic and industrial activities, stability and duration of remission of the disease.

PHYSICAL REHABILITATION FOR OSTEOARTHRITIS

Determination of deforming osteoarthritis.

Deforming osteoarthritis (DOA) - chronic, non-inflammatory joint disease, which is based on degenerative-dystrophic lesion of the musculoskeletal system (MSS).

The term "arthrosis" was proposed in 1911 by the German scientist Müller, to emphasize the fundamental difference between this disease and inflammatory lesions of the joints, that is, thereby differentiating it from arthritis. The disease progresses for a long time and constantly progressing. Osteoarthritis occupies a leading position in rheumatology. It accounts for up to 80% of all articular pathology. Most often, the disease occurs in women over 50 years of age. When aging there is a natural wear of all organs and tissues. Notexception and skeleton, where this process consists in rarefaction of bones and joint changes, which are designated as degenerative involutive. In people older than 65-70 years, osteoarthritis is detected in 97% cases. However, deforming osteoarthritis is not uncommon at a young age.

The development of deforming osteoarthritis occurs with a qualitative insufficiency of the articular cartilage, due to a violation of the trophism of chondrocytes. Cartilage is vascular gel. It contains up to 70% water. Synovial joint fluid nourishes the cartilage. Under mechanical load, the surface cartilage wears out, but this is compensated by the production of chondrocytes fibrillar structures. The main components of cartilage, thickness which in large joints reaches 5 mm, are:

1) collagen fibers.

2) chondrocytes, occupying less than 0.1% of its volume.

3) an intermediate substance, the main element of which is proteoglycans are made up of polysaccharides and protein.

Proteoglycans regulate local water balance. Early stages of OA, there is a decrease in proteoglycans, which immediately affects the hydration of cartilage, it loses its elasticity and in surface layers begin to crack. First this process compensated by chondrocytes that synthesize collagen and proteoglycans. Starting from the cartilage surface, the destructive process becomes irreversible over time. going on fibrillation, ulceration of cartilage, its thinning, up to complete exposure of the subchondral bone. Deprived of a cartilaginous shock absorber, it unable to withstand the increased load on the joint and undergoes secondary changes, consisting in the development subchondral osteosclerosis and marginal bone growths - osteophytes.

Osteoarthritis is usually divided into primary and secondary. Primary develops on a healthy joint, in previously healthy cartilage. Secondary - on pre-damaged cartilage: trauma, anomalies development of ODA, arthritis, etc. The most common primary monoarthrosis or polyosteoarthritis involving 4 or more joints. Thus, articular cartilage degeneration in primary osteoarthritis occurs by eight two main reasons:

1) excessive stress on the joint or joints, due to features of professional activity, in the classroom sports or being overweight.

2) a decrease in the resistance of cartilage to normal loads due to his genetic inferiority.

DOA is also influenced by internal factors:

1) heredity (in 61% according to Podchalimov V.V., 1982)

2) change in general metabolism (obesity)

3) violation of microcirculation. Strictly speaking, osteoarthritis, like osteochondrosis, not a nosological form, but an x-ray sign. It becomes a disease only after the appearance of the first clinical symptoms.

The disease usually develops gradually, gradually. Before the joints of the legs suffer, which account for the maximum load: hip, knee. In most cases, coxarthrosis develops on the background of hip dysplasia. Equally cause coxarthrosis can be aseptic necrosis of the femoral head, disease Perthes, inflammation of the joint. Approximately 40% of arthrosis of the hip joint in adults is the result of defects not cured in childhood joint development.

At the heart of the pathogenesis of osteoarthritis are circulatory disorders and venous stasis, leading to hypoxia of joint tissues: accumulation in of them are underoxidized metabolic products that activate proteolytic enzymes and hyaluronidase of synovial fluid, degrading cartilage proteoglycans. Matter violation calcium metabolism, functional overload of the joint and articular incongruity.

Stages of deforming osteoarthritis

STAGE 1 - the function of the joint is not impaired or with a slight limited range of motion. Slight passing pains. On the radiographs: small, marginal growths. Articular height cracks are normal.

STAGE 2 - the function of the joint is impaired, movements in the joint are frequent accompanied by a rough crackle. Pain is permanent intensify under load. Moderate muscle wasting corresponding limb segment. X-ray marked significant narrowing of the joint space.

STAGE 3 - movements are severely limited, the affected joint is in a forced position. The joint is deformed, thickened. Hypotrophy of the muscles of the entire

limb is expressed. On radiographs: progressive and complete destruction of articular cartilage. joint space is not traceable. The direction of movement restriction depends on anatomical features of each joint, localization and severity of marginal bone growths. With osteoarthritis hip and shoulder joints are primarily limited to abduction, extension in the knee joint suffers.

Based on clinical and radiological findings in OA, it can be concluded that at stage 1 of the disease there is a possibility preserve joint function, long-term remission can be achieved. At 2 stage, it is impossible to restore the function of the joint, but it is possible to save available range of motion in the joint and, by developing compensatory eleven mechanisms to stabilize the patient's condition. At stage 3 speech can only be about increasing the stability of the joint and developing compensatory-adaptive mechanisms (before and after surgery).

An early symptom of OA of any localization is arthralgia. AT conditions of thinning or loss of cartilage, the source of pain is well innervated periosteum and periarticular ligaments. At the beginning of the pain appear when standing for a long time, climbing stairs, etc. At rest she passes quickly. The phenomenon of "starting pains" is characteristic, when with difficulty only the first steps are given. Further arthralgia becomes persistent character, disturbing at night. It is often accompanied by morning stiffness, which, unlike rheumatoid arthritis, lasts

A couple of minutes. In the late stage of deforming osteoarthritis, joint deformity is noted and limiting their mobility. The sooner treatment begins, the more efficient and more consistent results. However, as a rule, patients seek help already having a clinical and radiological stage 2 deforming osteoarthritis. Usually, stage 1 is not diagnosed and proceeds without treatment.

Diagnostic signs of deforming osteoarthritis:

1) joint pain during movement and physical activity

2) deformation of the joints due to bone growths, including Heberden's nodules

3) limitation of joint function due to pain and bone growths

4) no signs of local inflammation, except for reactive synovitis with joint effusion

5) general good condition of the patient

6) narrowing of the joint space and osteosclerosis of the articular surface (according to X-ray data).

Therapeutic exercise for osteoarthritis

Exercise therapy is a method of functional and pathogenetic therapy patients with deforming osteoarthritis of large joints, since exercise therapy funds are aimed at reduction of tissue hypoxia due to the activation of general and local circulation, to reduce venous stasis and edema by improving microcirculation. With a dosed load, metabolism is normalized, the joint is unloaded and stabilized, mainly due to strengthening the muscular system. In order to define tasks and select means and forms of exercise therapy, it is necessary to take into account not only the stage osteoarthritis, but also the period of the disease in accordance with the severity pain syndrome, causes of its development, clinic and general condition sick.

The sooner treatment is started, the more effective treatment results. Given that the first stage of OA is usually not is diagnosed and proceeds without treatment, it is necessary to carry out preventive actions. For example, a teenager with a history of conservatively treated congenital hip dislocation, prohibit weightlifting, athletics and other sports, giving a large load on the joints of the lower extremities. Swimming and therapeutic exercises should be recommended.

At any stage of OA, exercise therapy funds should be directed to stabilization and unloading of the joint due to strengthening and training muscle groups surrounding it.

Allocate an acute period, subacute and a period of remission.

OSTEOARTHRITIS EXACERBATION PERIOD

Osteoarthritis exacerbation period: with a pronounced pain syndrome the main goal is to reduce pain. To leading therapies, include medical therapy and orthopedic measures. It is necessary to create rest conditions for the diseased joint. In case of damage to the joints of the lower extremities, bed rest and walking without support on a limb (on crutches). At stages 1 and 2, precise traction is possible.

Contraindications for the appointment of exercise therapy are:

1) a pronounced inflammatory process in the joint with a rise body temperature

2) concomitant infectious and somatic diseases in exacerbation phase

3) therapeutic exercises are not performed on the day of the introduction of drugs into the joint.

Goals of exercise therapy:

1) tonic effect on the cardiovascular and respiratory system.

2) improvement of blood circulation in the affected limb.

3) relaxation of the muscle groups surrounding the joint.

4) prevention of stiffness in adjacent joints.

Therapeutic gymnastics (TG) during the period of exacerbation was carried out for 10-15 minutes, 2-3 times a day. A prerequisite is unloading the affected joint, i.e. in starting position lying on your back. Starting position standing and sitting used for diseases of the joints of the upper limb. Performed free, dynamic movements in distal joints diseased limb, exercises for active and passive relaxation muscle groups surrounding the joint. Exercises are performed smoothly at a slow pace, without causing an increase in pain. TG complex also includes general developmental exercises for healthy limbs and various breathing exercises.

For the affected joint, positional treatment is applied, i.e. the joint is given a position in which the maximum relaxation of the muscle groups that stabilize the joint is achieved. Treatment with position reduces pain and prevents development of stiffness in the joint. Change positions throughout the day joint, for example, from a flexion to an extensor position.

The scheme of complex rehabilitation of a patient with osteoarthritis during an exacerbation

1. Position treatment
2. Classical massage, cryomassage
3. Isometric and relaxation exercises
4. General developmental and breathing exercises
5. Rubber shock absorber exercise
6. Occupational therapy
7. Diet therapy and vitaminization
8. Drug therapy, herbal medicine
9. Physiotherapy: electrophoresis, phonophoresis, UV radiation

SUBACUTE PERIOD OF OSTEOARTHRITIS

As the pain manifestations decrease, in the absence of effusion in joint, the goals of exercise therapy are:

1) improving blood circulation in the joint,

2) normalization of muscle tone and restoration of possible amplitudes of movement in the joint at 1-2 stages of deforming osteoarthritis.

Patients walk on crutches with a partial load on the limb.

Therapeutic gymnastics is carried out for 20 minutes individually or small group method. Exercises are performed only in the position joint unloading (lying on the back, side, stomach, standing on all fours, standing without limb support). This allows you to save diastasis between articular surfaces. Lightweight, flywheels are performed movements in the affected joint to the point of pain. Isometric training of weakened muscle groups in series of 5-10 tensions with exposure up to 5-7 seconds and relaxation of contracted muscle groups. Lightweight dynamic exercises are performed, swing movements in the affected joint with amplitude up to pain in combination with dynamic exercises in adjacent joints. Especially water exercises are recommended: for the upper limbs they are carried out in a horizontal plane, for example, with foam dumbbells, balls, etc. For the lower limb - standing at the side, standing good foot on the step.

For greater unloading of the joints of the lower extremities, it is used traction along the axis of the limb, carried out by a load fixed in area of the ankle joint.

After TG and/or exercise in the water, treatment is prescribed by position, that is, the limb is fixed for 10-15 minutes in the position of the maximum achieved range of motion. For this, special tires or sandbags are used.

Massage. Course 10-15 procedures of classical and underwater massage. A relaxing massage is performed on contracted muscle groups and firming massage on hypotonic muscles.

Underwater massage is carried out at a water temperature of 36°, with pressure 1-1.5 atmospheres. After the massage, you can perform techniques manual therapy aimed at post-isometric relaxation.

The scheme of complex rehabilitation in the subacute period of osteoarthritis

1. Position treatment
2. Isometric and relaxation exercises
3. Breathing, general developmental exercises
4. Physio- and hydrotherapy
5. Occupational therapy
6. Classical and segmental massage, cryo- and vibromassage
7. Hydrokinesitherapy
8. Drug therapy. Phytotherapy
9. Diet therapy, vitaminization

PERIOD OF REMISSION OF OSTEOARTHRITIS

The goals of exercise therapy:

1) strengthening the muscle groups of the limb in order to unload and stabilization of the affected joint

2) restoration of muscle endurance to long-term static and dynamic loads.

3) prevention or correction of concomitant disorders of the musculoskeletal system.

4) development of compensatory skills

5) general tasks: weight control, cardiovascular training systems.

Therapeutic gymnastics is carried out for 30 - 40 minutes daily, small group method. For arthrosis of the upper extremities starting positions are used: lying, sitting, standing. are given dynamic exercises with and without objects. Static and dynamic exercises with a load are performed only in starting position lying down or sitting with your hands resting on the surface of the table. Train predominantly muscles that stabilize the joint. For arthrosis of the lower limbs is used mainly by ip. lying on the back (on the stomach, side, on all fours). In diseases of the ankle joint and knee applied starting position sitting on a chair, with damage to the hip joint - standing with a healthy leg on an elevation of 10-15 cm. From these initial positions, dynamic exercises are performed, swing movements with maximum amplitude. Includes static and dynamic weight training exercises.

Training of muscle groups is carried out selectively. Therefore, in sixteen this period, in addition to TG, you can use pendulum and block mechanical devices, simulators, occupational therapy. Well-developed muscular system of the diseased limb helps to preserve the function of the joint in the initial stages of the disease and creates compensatory mechanisms for gross changes in the joint. The period of formation of compensatory mechanisms is long and is achieved by systematic training.

Therefore, TG classes after discharge from the hospital should be continued in the clinic, in a sanatorium or at home. Recommended swimming lessons - in the style of "breaststroke" or "crawl", swimming in fins. At II-III stages of the disease of deforming osteoarthritis of the lower extremities, it is necessary to walk with cane or crutches.

A well-developed muscular system of the diseased limb helps preserve the function of the joint in the initial stages of the disease and create compensatory mechanisms for gross changes in the joint. Period formation and improvement of

compensatory mechanisms requires great effort from the patient himself. The necessary condition is systematic training.

Unfortunately, with the ineffectiveness of conservative treatment in a number of cases, surgery is used. Operations in patients deforming osteoarthritis are divided into 2 groups:

1. operations that preserve mobility in the joint

2. surgery, closing the joint.

Most often, surgical treatment is performed for coxarthrosis, which can develop during sports, injuries, significant physical loads. Group I operations include osteotomies, the effect of which associated with improved biomechanical conditions and joint vascularization, as well as alloplasty, etc. At the III degree of coxarthrosis, joint arthroplasty. It relieves excruciating pain, maintains mobility in the joint, provides support limbs.

In childhood, surgical treatment is used more often compared with adult patients. This is due to the need correction of deformities of the epiphyses that form the joint, and prevention progression of the degenerative-dystrophic process. Indications for operations in children are available for any etiology of the disease at any stage in the presence of deformity of the epiphyses. Osteotomies are usually performed in stages I and II of the disease. At II and III stages with pronounced intra-articular deformities of the epiphyses, preference is given to arthroplasty.

Exercise therapy is used both in preparation for surgery and after it. TG is carried out individually. In the postoperative period tasks. Exercise therapy is determined by the characteristics of the course of this period, the presence complications: circulatory disorders in the limbs, thrombosis, muscle atrophy, limited mobility in the joints. As well as method of surgical intervention. Currently after the operation does not require additional external immobilization, which allows you to quickly activate patients. They start early move around with crutches.

After reconstructive and restorative operations on the joints tools are used to facilitate the implementation of active movements: polished surfaces, sleeve pull blocks, Balkan frames, favorable starting positions. With damage to the large joints of the lower limbs TG is carried out from starting position lying and sitting. Feature postoperative management of patients is to develop a function joint with late axial load on it. And with arthrodesis and arthroplasty - early isometric muscle training, stabilizing the joint.

In the polyclinic, patients operated on the joints continue their LG classes according to the method of the period of remission. Load on the operated leg allowed to give after 6 months. In children, the period of joint unloading 1 year or

more. It passes against the background of functional treatment. Such the duration of unloading is needed to rebuild the bone structure epiphysis. The main task of exercise therapy at this stage is to increase stability of the operated joint. Therefore, the main focus is given to strengthening and training the muscles surrounding the joint. Especially effective exercise in the water. They start as soon as reduce pain and increase range of motion in the affected joint. **Hydrokinesitherapy** is carried out at a water temperature of 32-20°C. The duration of the procedure is 15-30 minutes. Course 10-15 procedures. TG in swimming pool can be combined with underwater cuff traction for elimination of reflex-pain contracture. Therapeutic gymnastics in water with special belts and cuffs on the ankle joints allows you to unload the joint by training the muscles of the lower limbs. The rehabilitation complex is especially effective for patients who have a risk factor for developing osteoarthritis (for example, in former athletes).

Mechanotherapy is contraindicated. Sanatorium-and-spa treatment is indicated after 6-8 months.

Massage is prescribed for all patients with osteoarthritis. It stimulates lymph and blood circulation, promotes an increase in contractile muscle ability, restores function. Massage is scheduled for depending on the location of the lesion. Can be massaged corresponding segmental zone. Course 10-15 procedures for 15-20 minutes. Break 10-15 days.

The effectiveness of exercise therapy is assessed by the amplitude of movement in the joint and the functional state of the muscles surrounding the joint (tonometry, electromyography, dynamometry).

Scheme of complex rehabilitation during OA remission

1. Position treatment
2. Breathing, general developmental exercises, exercises with items in starting position lying, sitting, on all fours
3. Isometric exercises or electrical stimulation
4. Hydrokinesitherapy (running, exercises with cuffs.)
5. Drug therapy
6. Segmental, classic, vibration and vacuum massage
7. Cryomassage of joints and swimming
8. Oxygen therapy
9. Sauna and swimming
10. Cryomassage and training on simulators in a gentle mode
11. Diet therapy, vitaminization

APPROXIMATE BASIS OF CLINICAL AND PHYSIOLOGICAL RATIONALE FOR PRESCRIBING EXERCISE THERAPY TO A PATIENT WITH OSTEOARTHRITIS

The goals of exercise therapy:

1. Therapeutic - is to improve blood and lymph flow, stimulation reparative processes, desensitization of the body.

2. Preventive - prevention of physical inactivity, warning development of contractures and ankylosis, counteracting the development degenerative-dystrophic changes in the joints.

3. Adaptation - preparation for self-service, return to work.

Means of exercise therapy:

1. Therapeutic gymnastics (LG)
2. Massage: manual, hardware, self-massage
3. Position treatment
4. Occupational therapy
5. Individual tasks for the patient

Features of the method of therapeutic exercises for osteoarthritis:

1. It is necessary to reduce the intensity of the load on the affected joints. Walking is strictly dosed.

2. Exclude not only dynamic, but also static loads: use starting position sitting, lying down. Verticalization is strictly dosed.

3. Eliminate endurance loads. Load during the day should be distributed evenly. The number of repetitions of exercises is average - 6-8 times.

MASSAGE TECHNIQUE FOR DEFORMING OSTEOARTHRITIS

With deforming arthrosis (deforming osteoarthritis) of the knee joint first massage the corresponding segments of the spine, then thigh muscles, using stroking, rubbing with the base of the palm, fingertips, kneading longitudinal and transverse with two hands. The goal is to create hyperemia. Improve tissue exchange. Then massage the knee joint, using planar and encircling continuous stroking, semicircular rubbing in different directions, alternating with embracing continuous stroking. The strength with which massage techniques are performed depends on sensitivity of massaged tissues. Improves lymph and blood flow; and tissue exchange massage in warm water (36-38).

For deforming osteoarthritis of the ankle joint, fingers, foot, applying stroking and rubbing, and when massaging the joint – circular rubbing, forceps-like, embracing stroking. special attention is paid to the massage of the ankles, calcaneal tendon, and as well as calf muscles. They are massaged in the direction from the foot to knee joint, using stroking, kneading.

With arthrosis of the elbow joint, the joint itself is not massaged, so how massage, increasing blood and lymph flow in this area, contributes to calcification of the anterior joint capsule. Massage is carried out in sequences: the cervicothoracic spine is processed column, muscles of the shoulder girdle, shoulder, forearm. Apply tricks stroking, rubbing, kneading. Finish the massage with active passive movements and stroking the entire limb from the hand to the axillary cavity. The duration of the massage is up to 15 minutes.

With coxarthrosis massage the back, gluteal muscles and lower limbs, using stroking, rubbing and kneading. Impact moves are not used. Massage duration up to 15 minutes. Course 10-15 procedures. A good remedy is cryomassage hip joints for 3-5 minutes every other day. Course 5-8 procedures.

PHYSICAL REHABILITATION FOR POSTURE DEFECTS, SCOLIOSIS AND FLAT FEET

In the process of growth of the body for various adverse reasons, there may be deformities of the spine, legs, feet. They are divided into congenital and acquired. The latter can be the result of injuries, infections, intoxications, lesions of the nervous system, metabolic diseases, static disorders on the background of hypodynamics. Often deformations occur due to a combination of several factors.

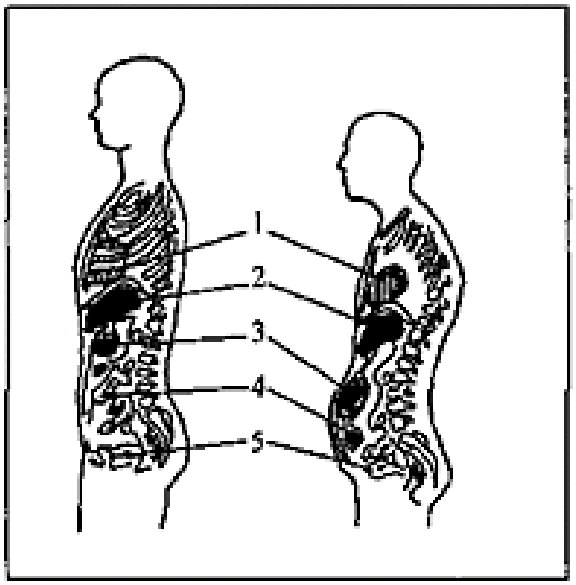
The most common deformity is **curvature of the spine**.

Normally, the spine has **four** physiological curves. Two of them - cervical and lumbar - directed convexity forward (lordosis), and thoracic and coccygeal - backward (kyphosis). These physiological curves are formed during the growth and development of the child, the newborn's spine is almost straight. Cervical lordosis occurs when a child begins to raise his head and maintain this posture; thoracic kyphosis is formed during the acquisition of a sitting position; lumbar lordosis and coccygeal kyphosis appear in the process of mastering the skills of standing and walking. The severity of physiological curves depends on the angle of the pelvis, with which the spine is fixed. Therefore, with increasing pelvic angle, the curvature of the curves also increases, and with decreasing - the curves of the spine flatten. Due to these curvatures and cushioning properties of the intervertebral cartilages provide spring functions and mobility of the spine. Its stability in the vertical position is due to the tension of the surrounding muscles, their continuous coordinated work. In cases of overload of the same muscle groups and their fatigue, the uniform traction of the muscles is disturbed, which can lead to changes in the magnitude of lordosis or kyphosis, lateral curvature of the spine. At frequent repetition of these states, they are fixed that causes disturbance of a posture and entails redistribution of a muscular tone, weakening of muscles, decrease in spring function of a backbone, changes in activity of the main systems of an organism.

Treatment of posture defects and musculoskeletal deformities is complex. It involves the use of exercise therapy together with massage, physiotherapy, tempering, hygiene and wellness activities in the mode of study, work and rest. The main factor among them is exercise. The need for their use is due to the multifaceted effects on the body. First of all, they increase the overall tone, activate the CNS, cardiovascular, respiratory and other body systems, stimulate metabolic processes, redistribute muscle tension, strengthen muscles, create a muscular corset. Systematic exercise trains a person, promotes the emergence and consolidation of new conditioned reflexes, destroys the stereotype of improper posture.

POSTURE SET

Posture is the usual posture of a person who stands casually, acquired without excessive muscle tension: the torso and head are kept upright, the spine forms a smooth wavy line, the contours of the chest protrude, the abdomen is slightly tightened, legs are stretched at the hips and knees. Posture is an expression not only of the external beauty of man, but also evidence of his health, the key to optimal position and functioning of internal organs.



Comparison of the location of internal organs in normal posture and posture defect

1 - heart; 2 - liver; 3 - stomach; 4 - intestines; 5 - the bladder

Normal posture is characterized by six main features

1 - the location of the spinous processes of the vertebrae on one vertical line;

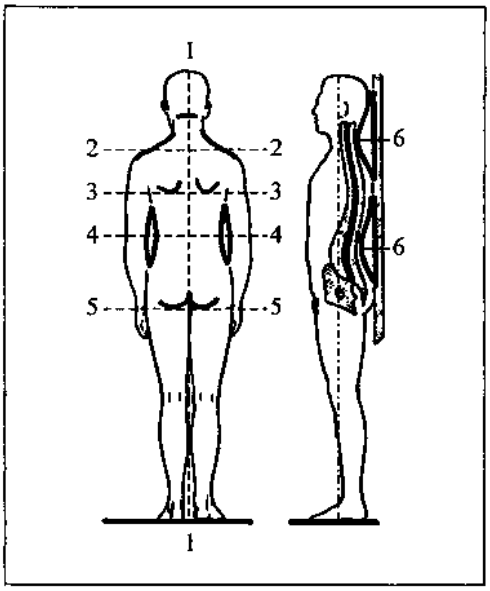
2 - the location of the upper arms, shoulders at the same level;

3 - the location of the angles of both blades at the same level;

4 - equal triangles of the waist, formed by the lateral surface of the body and free arms;

5 - the location of the buttocks at the same level;

6 - correct curves of the spine in the sagittal plane (depth of the lumbar lordosis - up to 5 cm, cervical - up to 2 cm).



Signs of normal posture

Maintaining and maintaining a normal posture depends on the harmonious development of muscles and its ability to keep in the correct position the spine, head, shoulder girdle, torso, pelvic angle, limbs; the state of the musculoskeletal system; physical and mental health, living and working conditions, etc.

Deviations from normal posture are called posture disorders or defects. They occur in debilitated children who have suffered from infectious diseases or often suffer from colds. Posture disorders can be observed in practically healthy children in the case of improper physical education, with the use of inadequate age of the child's physical activity. Posture defects often occur in radiculitis, arthrosis and arthritis, peptic ulcer disease and other diseases.

Posture defects can be in the *sagittal* and *frontal* planes. In the sagittal plane there are disorders with increasing and decreasing physiological curvatures of the spine. The first include:

- *stooping* - an increase in thoracic kyphosis with a decrease in lumbar lordosis;
- *round back* (total kyphosis) - an increase in thoracic kyphosis with almost complete absence of lumbar lordosis;
- *round concave back* - increased curvature of the spine as kyphosis and lordosis and pelvic angle.

With a stooping and round back, the head is tilted forward, arched back, drooping shoulders and raised wing-like shoulders, swollen chest, bulging abdomen, legs slightly bent at the knees. At such defects of a posture ligaments and muscles of a back are stretched, and pectoral muscles are shortened. This, together

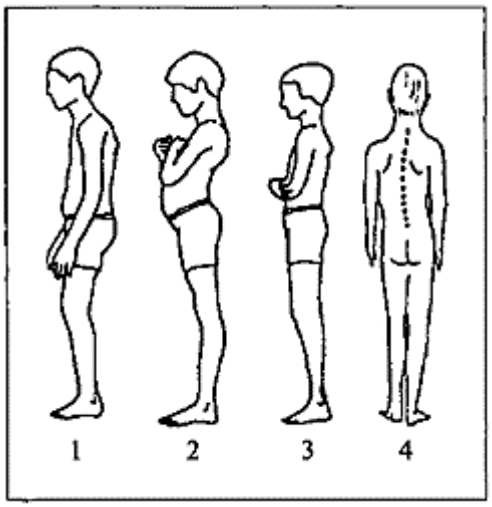
with the weakened abdominal muscles, affects the respiratory excursion of the chest and diaphragm, reduces the suction force of the chest and complicates the work of the heart. With a rounded back in the upper part of the body there are almost the same changes as with a round back. However, in the lower part, due to the excessive lumbar curvature of the spine, the inclination of the back increases, the abdomen sags, its muscles are stretched, the knees are maximally stretched; the muscles of the posterior surface of the thighs, attached to the gluteal hump, are stretched compared to the muscles of the anterior surface.

Posture disorders with a decrease in physiological curvatures of the spine include:

- *flat back* - thoracic kyphosis smoothed, and lumbar lordosis flattened;
- *flat-concave back* - reduction of thoracic kyphosis with normal or slightly enlarged lumbar lordosis.

With a flat back, the chest is flattened, narrow, the shoulders hang down, the shoulders are winged, the inclination of the pelvis is reduced, the lower abdomen is convex. Due to the reduction of bends, the spring function of the spine is impaired, which negatively affects its cushioning properties and increases the shaking of the brain and spinal cord during jumping, running and other movements. Children with this posture are prone to developing scoliosis.

Posture defects in the frontal plane include *asymmetric*. It is characterized by changes in symmetry between the right and left halves of the torso. The spine is an arc turned vertex to the right or left, the shoulder and shoulder blade on one side are lowered, uneven waist triangles.



Posture disorders:
1 - stooping; 2 - round concave back; 3 - flat back; 4 - asymmetric posture

These posture disorders are not diseases, but functional disorders, primarily of the musculoskeletal system. However, they change the resistance of the spine to deforming effects, weaken depleted muscle groups, disrupt the relationship of internal organs and adversely affect their function, which makes the spine and the body as a whole prone to various diseases.

If a posture defect is detected, its elimination should be started immediately. First of all, you need to organize a proper daily routine, establish a balanced diet, apply physical rehabilitation. The latter is used in the form of exercise therapy, therapeutic massage, physiotherapy.

Therapeutic physical culture is carried out in preschool institutions, special medical groups in secondary and higher educational institutions, polyclinics, sanatoriums. Its tasks:

- improving the emotional state and normalization of major nervous processes;
- improving the activity of the cardiovascular, respiratory and digestive systems, metabolic processes;
- strengthening weakened muscles of the back and torso, increasing the level of strength and general endurance;
- formation and improvement of motor skills and improvement of general physical development;
- posture defect correction, education and consolidation of correct posture skills.

These tasks are implemented by including in the complex of therapeutic, hygienic gymnastics and independent classes of general developmental, breathing and special corrective exercises; use of swimming, walking and running, sports games, skiing and other forms and means of physical culture. It is recommended to exercise daily at home, using Evminov's prophylaxis.

Gymnastic exercises are performed from the starting position standing, sitting, standing on your knees, lying down and hanging in different positions of the head, torso, arms and legs. The choice of starting position in each case is determined by the nature of the violation of posture, the tasks.

Therapeutic gymnastics classes are held for 30-45 minutes with a group of 10-12 people 3-4 times a week. The whole cycle of classes is divided into 2 periods - preparatory and basic. In the preparatory period, they create an idea of the correct posture and create physiological prerequisites for its consolidation. In the main period, this work is completed.

Therapeutic gymnastics classes include general and special exercises. The first is aimed at improving the physical development of the child, the second - to correct the wrong posture. They contribute to the normalization of the angle of the pelvis, the correction of disturbed physiological curves of the spine, the position and shape of the chest, the symmetrical position of the shoulder girdle.

The basis for the normalization of the relationship of body parts is to strengthen the natural muscular corset. The best starting positions for this are those that ensure the unloading of the spine - lying on your back and abdomen and, especially, standing on your knees, which allows you to purposefully act on certain parts of the spine. Exercises performed from these starting positions should be symmetrical, alternating with muscle relaxation and breathing exercises.

Depending on the type of posture defect, appropriate exercises are selected. At stooping, increase in a thoracic kyphosis it is necessary to strengthen long muscles of a back. Apply the extension of the body from the starting position lying on his stomach, standing on his knees (knees and palms, knees and forearms, knees and outstretched arms). Extension of the torso should be performed with different positions of the hands, with objects, with weights.

At increase in a lumbar lordosis it is necessary to strengthen abdominal muscles, you-using movements of legs lying on a back: "bicycle", raising of straight legs, transition to a lying position, to a sitting position, etc.

In cases of reduction of physiological curvatures of the spine, exercises should be aimed at strengthening the muscles of the back and abdomen, movements with a small load (dumbbells weighing 0.5-1 kg) are recommended.

To eliminate the asymmetrical posture use symmetrical exercises that balance muscle tone on the convex and concave side of the spine. Circular movements of the arms back, bending the arms to the back of the head and shoulders are special exercises for the wing-like shoulders.

Posture correction is achieved through the simultaneous formation of the skill of proper posture. This is due to the development of musculoskeletal sensation, which allows you to independently assess the position of individual parts of the body. For its development use: training in front of a mirror; control of those involved, one after another; exercises for upbringing the correct posture, standing with your back to the vertical plane (walls, doors), resting on the back of the head, back, buttocks and heels; correction of the defect on the instructions of the instructor. The skill of correct posture is developed and consolidated during the performance of general developmental exercises, balance, coordination exercises, during games. An approximate set of exercises for the formation of posture and correct posture is given below (by O.D. Dubogai, V.I. Zavatsky, Y.O. Korop, 1995).

Approximate set of exercises near the vertical plane

1. Acquire the position of the correct posture near the vertical plane (walls, doors). Remember this position and, without violating it, take a step forward and then back.
2. The same, but take 4-8 steps.
3. The same, but check the position of the posture in front of a mirror to remember it visually.
4. Leaning against the wall with the back of the head, back, buttocks and heels, sit with a straight back, arms up, return to starting position.
5. Standing near the wall in the correct position, raise your hands up, to the sides, forward, put on your waist, without losing the correct position and without moving away from the wall.
6. The starting position is the same. Bend your right leg forward, grab the shin with your hands and press to the torso, without losing the correct posture and without moving away from the wall. The same with the left foot.
7. The starting position is the same. Raise your arms forward and straighten your left leg without moving away from the wall. The same with the right foot.
8. Starting position - the same, hands on waist, elbows pressed to the wall. Raise the left leg to the left to a horizontal position without moving away from the wall. The same with the right foot.
9. Starting position - the same, hands to the sides. Lean to the left leg without changing the position of the arms and without moving away from the wall. The same goes for the right leg.

Perform each exercise 8-10 times.

Approximate set of exercises with objects on the head

1. In the position of correct posture near the wall, put on your head a bag of sand (200-300 g), a book or other object, go to the opposite wall and back, bypassing the chair, table, etc., holding the object and maintaining posture.
2. From a standing position with an object on his head sit on the floor, get on your knees and sit on your heels, return to starting position without losing the object and maintaining posture. The same - with eyes closed.
3. With an object on your head, get on a chair and get off it.
4. Starting position - feet on one line (one after another), holding the correct posture and object on the head, perform various movements of the hands - sideways, up, forward, front circles, etc. The same - with eyes closed.
5. Holding a gymnastic stick on your fingers and an object on your head, go 8-10 steps without losing objects. The same - with a turn around.
6. Holding a gymnastic stick in the palm of your hand vertically and an object on your head, sit on a chair, get up without losing objects.

7. With the object on your head, bend your left leg forward as high as possible without losing the object. The same with the right foot.

8. The starting position is the same. Bend the right leg forward, grab the knee with the left hand, take the right hand back without losing the object. The same with the left foot and the right hand.

9. Get on your knees with an object on your head half a meter from the wall, rest your hands on the wall, keep your torso straight. Put your right foot in focus without dropping the object. The same with the left foot.

Perform each exercise 8-10 times.

The effectiveness of therapeutic gymnastics is significantly increased with the use of hydrokinesitherapy and swimming. Classes are held at least twice a week at a water temperature of not less than 26 ° C and air 25-26 ° C. Class duration is 40-55 minutes; this includes 10-20 minutes of simulation and preparatory exercises on land. In the water use a variety of exercises to develop muscle strength and endurance, correcting and educating the correct posture. Rubber shock absorbers, flippers, inflatable wheels are used, which are fixed at the level of the pelvis, which prevents bending in the lumbar region and relieves the spine, as well as inflatable and plastic toys, balls, foam boards and other supports.

The choice of **swimming** style is determined by the nature of the defect. To eliminate stooping, total kyphosis, it is recommended to swim freestyle or breaststroke on the back, asymmetrical posture - swimming on the side and breaststroke on the chest or back. The latter style is the main one in most posture disorders, as it consists of symmetrical consecutive swimming movements of the arms, legs and sliding. It is clear that this style of combating posture defects can be used by people who can swim, and those who can not, should be taught to swim and then choose a style.

Therapeutic massage is used to strengthen stretched and weakened muscles and, conversely, to relax and stretch tense muscles; increase the overall tone. Apply alternate manual and underwater shower-massage. Weakened long muscles of the back and interscapular area are massaged by kneading, deep rubbing, tapping, and intensive stroking. The muscles of the anterior surface of the torso are affected by stroking, rubbing and kneading.

Physiotherapy is aimed at general strengthening of the body, stimulation of weakened muscles, increasing the adaptive capacity and non-specific resistance of the body, hardening. Use sun and air baths, UV in autumn and winter; inkjet and circular showers, douching, wiping, fresh and pine baths; electrical stimulation of weakened muscles; climatotherapy.

SCOLIOSIS

Scoliosis is a chronic progressive disease of the spine, characterized by arcuate curvature in the frontal plane and twisting of the vertebrae around the vertical axis. As a result, a rib protrusion may develop, followed by a rib hump. Scoliosis is accompanied by various disorders of the location and functioning of internal organs, especially the cardiovascular and respiratory systems, so it is considered not just as a curvature of the spine, but as a scoliotic disease.

The causes of this disease are divided into three groups.

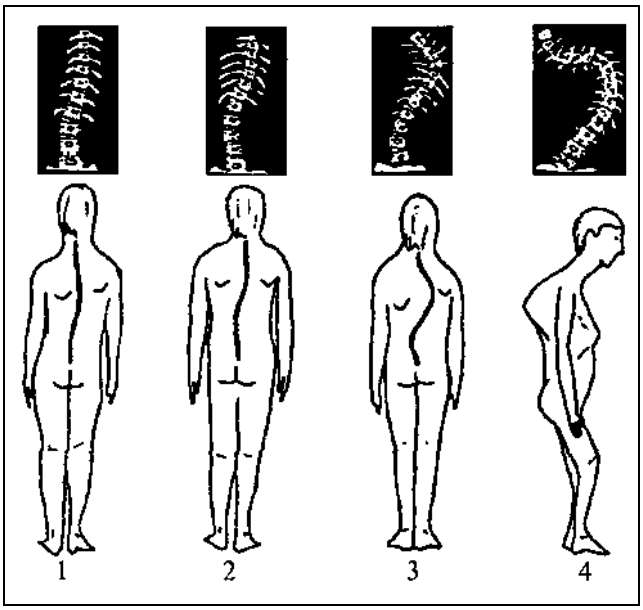
- The first of them is the primary painful factors. These include disorders of vertebral growth and development, congenital wedge-shaped vertebrae, the presence of additional ribs, the fusion of the fifth lumbar vertebra with the coccyx.
- The second group is related to static-dynamic factors that lead to compensatory curvature of the spine. It occurs in long-term asymmetric body position due to shortening of one limb, in the presence of large burns and other origins of scars on one side of the body, chronic diseases of the peripheral nervous system and spine.
- In the third group of factors contributing to the development of scoliotic disease, the main is the reduction of the body's resistance after severe illness during the period of intensive growth of the body.

Depending on the severity of the disease there are 4 degrees of scoliosis. The criterion for their separation is the shape of the scoliosis arch and the angle of its deviation from the vertical axis, the degree of twisting of the vertebrae. According to the place of formation of the primary arch, scoliosis is divided into thoracic, lumbar-thoracic and lumbar, and in the direction - left and right.

- At scoliosis of the I degree the angle of deviation of a primary arch makes about 10 °. The spine resembles the letter C. Volitional muscle tension and unloading in a horizontal position reduce these manifestations.
- Scoliosis of the II degree is characterized by emergence of an additional compensatory arch of curvature therefore the backbone gets the form of the Latin letter S. The angle of deviation of the main arch reaches 30 °. Vertebral twisting, costal protrusion and muscle roller are detected. This is accompanied by a violation of the location of internal organs and their functions. Horizontal position and slight elongation do not change the curvature.
- Grade III scoliosis is characterized by the presence of at least two arches. The angle of deviation of the main arc is 30-60 °. Significant twisting of vertebrae, deformation of the thorax and the formation of a costal hump, change in the angle

of inclination of the pelvis. This causes further disruption of the location of internal organs and their functions, irritation of the spinal cord roots and the appearance of symptoms of radiculitis.

- Grade IV scoliosis distorts the torso due to severe deformity of the chest and spine. There is kyphoscoliosis, which is the result of progressive deviation of the spine in both lateral and anteroposterior direction, further twisting of its axis and the formation of posterior and anterior hump. The angle of deviation of the spine from the vertical axis is more than 60 °. Significant dysfunctions of the chest and nervous system are revealed.

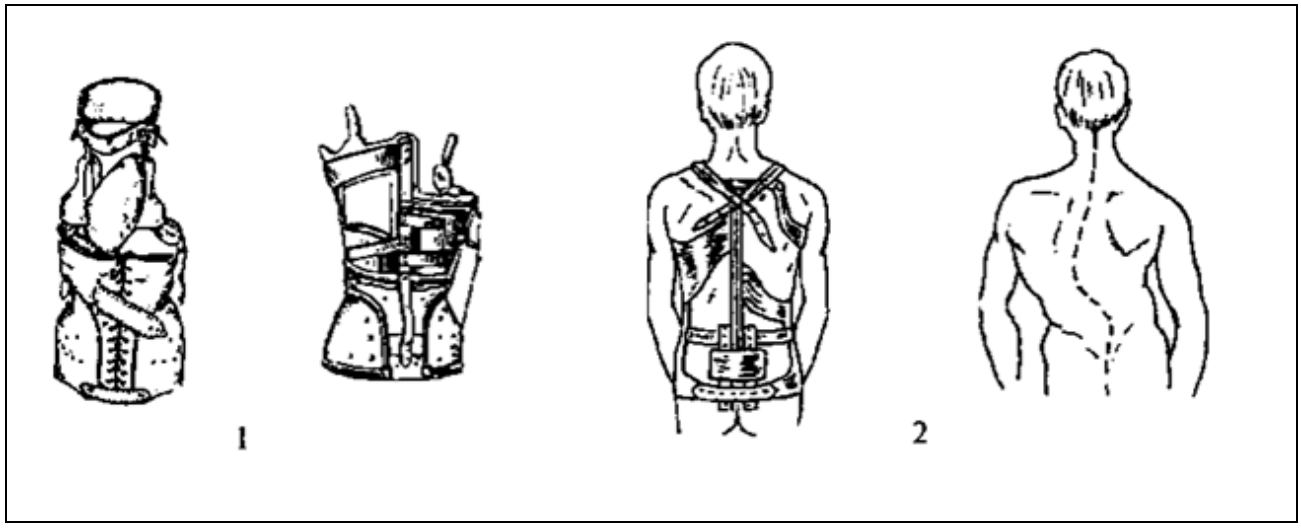


Degrees of scoliosis: 1 – I grade; 2 —II grade; C - III grade; 4 - IV grade

Treatment of scoliotic disease is complex. Along with general hygienic means, orthopedic methods of treatment, means of physical rehabilitation, exercise therapy, therapeutic massage, physiotherapy are used. In the case of ineffective long-term conservative treatment and progression of the disease in scoliosis II-IV degree sometimes perform surgery, the essence of which is to correct the deformity, followed by fixation of the spine. However, surgery does not always lead to a cure, so in the vast majority of the leading method of treatment of scoliosis is conservative.

Children with first-degree scoliosis are usually treated in a clinic, where they exercise, or at school in special medical groups. With a favorable course of the disease, they are allowed to do some sports: swimming (breaststroke style), skiing (classic course), rowing, sports games (volleyball, basketball).

Treatment of scoliosis of the II degree is carried out by specialists in exercise rooms, medical and sports dispensaries, and in case of disease progression children should be referred to specialized boarding schools. There are also patients with III-IV degrees of scoliosis. In these institutions, treatment is combined with education: children learn by lying on special benches; conduct physical education breaks at each lesson and 45-minute classes in therapeutic gymnastics, and in the morning - hygienic gymnastics. Use therapeutic swimming, elements of sports games. Corrective plaster beds, removable orthopedic corsets are used.



1 - functional corrective corsets for the treatment of scoliosis;
2 - correction of scoliosis with Zuckerman's corrective corset (Kharkiv, M.I. Sitenko Institute)

Therapeutic physical training is the most important tool in the complex treatment of scoliosis. its main special tasks:

• prevention of further progression of scoliotic disease, correction of scoliotic deformity in the early stages of the disease;

• stretching of shortened muscles and ligaments on the concave side of the spine and strengthening them on the convex side of the arch;

• strengthening the muscles of the back and chest, creating a muscular corset, correcting the spine;

• improving the activity of the respiratory and cardiovascular systems;

• education and consolidation of the skills of correct posture.

To perform these tasks, gymnastic exercises are used to strengthen the muscles of the back, abdomen, lateral muscles of the torso, mainly from a supine position, back, standing on his knees. This allows to increase the strength endurance of the muscles of the torso in the most favorable conditions for the formation of the muscular corset and the consolidation of the achieved correction.

Special corrective exercises - symmetrical, asymmetrical and detorsional - are used in therapeutic gymnastics classes. Symmetrical, maintaining the middle position of the spine, help to align muscle traction on both sides. This effect occurs due to the fact that when performing symmetrical movements, the stretched and weakened muscles on the convex side of the scoliotic arch contract more than the shortened and comparatively stronger muscles of the concave side. Under the influence of training, the muscles on the convex side are strengthened, and on the concave side they are stretched and there is a decrease in its hypertonia. This helps to eliminate or reduce the asymmetry of muscle traction and create a uniform muscular corset. Symmetrical exercises are simple, their implementation does not cause difficulties for patients and, most importantly, they do not lead to counter-distortions. Therefore, they are preferred in the treatment of scoliosis of all degrees.

Asymmetric corrective exercises have a concentrated effect on certain areas of the spine and if performed incorrectly can lead to the development of anti-curvature. Therefore, they should be selected together with a doctor and rehabilitation specialist and strictly dosed. Asymmetric exercises are performed from the starting position lying down, standing on your knees, standing and moving. They are contraindicated in the progression of scoliosis.

Detorsion exercises are used for scoliosis, when severe vertebral torsion predominates. These exercises involve the rotation of the vertebrae in the direction opposite to the torsion; correction of scoliosis with pelvic alignment; stretching of shortened and strengthening of stretched muscles in the lumbar and thoracic regions. Detorsion exercises are performed from the starting position, lying on an inclined plane (Evminov's prophylaxis), standing on your knees, standing, hanging on a gymnastic wall.

In the complexes of therapeutic gymnastics much attention is paid to breathing exercises, which not only increase the functionality of the respiratory and cardiovascular systems, but also contribute to the active correction of the spine and chest. During the exercises you should constantly pay attention to the education and consolidation of the skills of correct posture, to require accurate execution of exercises.

Swimming and hydrokinesitherapy are an integral part of the complex treatment of scoliotic disease. Motivation of classes, conditions and principles of their use are similar to those of posture defects. However, the method of swimming, the use of special exercises on land and in the water is changing. A distinctive feature of the technique is the strict control over the stabilization of the spine in the position of correction during all exercises and the exclusion of those that lead to its

mobilization. All these requirements are best met by the method of breaststroke. Swimming movements of the arms and legs are symmetrical, performed sequentially in one plane, excluding oscillations of the spine around the longitudinal axis. It is recommended to swim at a slow pace, with a prolonged phase of sliding after a kick.

Therapeutic massage has a general physiological effect on the body; It is also used to passively correct scoliosis, strengthen stretched and relax and stretch the contracted muscles of the torso.

Classic massage and underwater shower massage are used. Massage, mainly, the long muscles of the back, interscapular area, posterior and lateral surfaces of the chest, oblique muscles of the abdomen. Massage for patients with scoliosis of II-III degree is carried out differently: on the side of the convexity, where muscle tone is weakened and muscles are stretched, massage intensively using all techniques; on the concave side, muscle tone is increased and therefore apply stroking, vibration, stretching muscles, which contribute to their relaxation.

Physiotherapy is used to improve blood and lymph circulation; analgesic, tonic, corrective action on the spine and torso; strengthening the muscles of the back; normalization of the function of the neuromuscular complex and mineral metabolism; increasing the adaptive capacity and non-specific resistance of the organism, hardening. Apply electrical stimulation of weakened back muscles, diadynamotherapy, electrophoresis of anesthetic mixture, calcium and phosphorus, UHF therapy, ultraviolet radiation, paraffin-ozokerite applications, pine or fresh baths (36-37°C), shower and jet shower baths, climatotherapy.

FLATFOOT

Flatfoot is a deformity of the foot, which is characterized by flattening of its arch. There are longitudinal and transverse vaults. In a normal foot, the longitudinal arch has the shape of a niche and extends from the base of the big toe to the beginning of the heel and from the inner edge of the sole to its middle. The transverse vault is an arc formed by the heads of the mold bones with support on the 1st and 5th. The main force supporting the arch of the foot are the supinator muscles (anterior and posterior tibialis muscles) and flexor muscles (especially the long flexor digitorum longus).

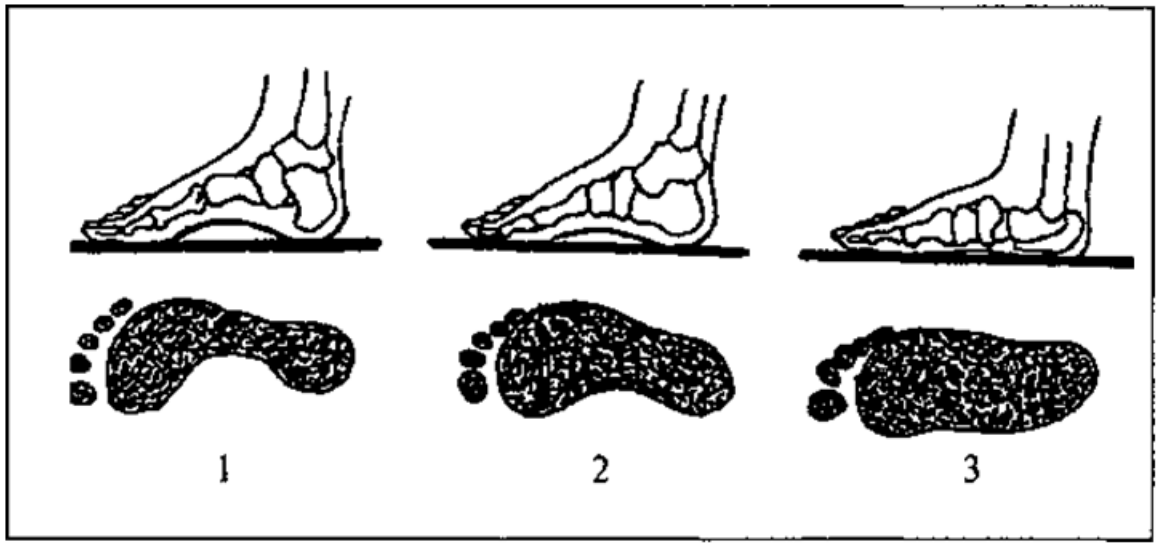
When reducing the longitudinal arch of the foot there is a longitudinal flatfoot, and transverse - transverse flatfoot. Sometimes these forms of flat bones are combined. Longitudinal flatfoot is often accompanied by removal of the front of the foot, raising its outer edge and pronation of the heel, the so-called valgus of the foot (flatfoot). In such cases, the inner bone is noticeably protruding, and the outer - sinks.

With flat feet, at the same time as the height of the vaults decreases, the feet are twisted, in connection with which the axial load falls on the flattened inner vault. The resorption of the foot decreases sharply. When the arch is flattened, the joint and ligament apparatus stretches, the muscles weaken, the foot bones fall and compress the nerve branches of the plantar surface of the feet, which causes pain in various parts of the foot and heel. Pain may also occur on the back of the foot, ankles, shin muscles, thighs, and sometimes the lumbar region.

Patients are also concerned about increased fatigue while walking or prolonged standing, headache. They change gait, often have scoliosis, weaken the muscular system, reduced physical performance, often there are disorders of internal organs.

Flat feet are congenital and acquired. Congenital is relatively rare and is a defect in fetal skeletal development. Acquired flat feet, depending on the reasons that caused it, are divided into rickets, paralytic, traumatic and static. The latter is the most common type of flatfoot. The main cause of static flat feet is the weakness of the muscles and ligaments that support the arch of the foot. It can occur with excessive fatigue, prolonged standing, wearing tight shoes, especially narrow, or high heels, with thick soles. When walking on high heels there is a redistribution of load from the heel area to the area of the transverse arch, which may not withstand it, and then begins to form a transverse flatfoot.

The condition of the arch of the foot is determined visually and when flat feet are suspected, the degree of its flattening is examined using plantograms - footprints. Chizhyn's method is most often used in practice. The essence of it: the subject is asked to stand first on foam rubber soaked in 10% solution of ferric chloride, and then - on paper moistened with 10% solution of tannin in alcohol. In the places of contact of the foot with the paper there is a dark imprint of the soles - plantogram.



Foot plantograms: 1 - normal, 2 - flattened, 3 - flat.

Flat feet are treated comprehensively, for a long time. Exercise therapy, therapeutic massage, physiotherapy, special shoes and insoles, general hygiene products are widely used. With significant flat feet, corrections are achieved with plaster casts with fixation of the foot in the varus position, and sometimes resort to surgery.

Therapeutic physical culture is used for all types of flat feet. Its tasks:

– strengthening of all organism, increase of force endurance of muscles of the lower extremities;

– correction of foot deformity, elimination of valgus heel position and increase in the height of the arch of the foot;

– education and consolidation of the stereotype of the correct posture of the body and lower extremities when standing and walking. Exercise therapy is prescribed for three periods (introductory, main and final).

During the introductory period, special exercises for the muscles of the lower leg and foot are performed from a supine and sitting position, which eliminates the influence of body weight on the arches of the feet. Special exercises alternate with

relaxation and general development exercises for all muscle groups. During this period, it is desirable to equalize the tone of the shin muscles, improve coordination.

In the main period it is necessary to achieve correction of position of foot and to fix it. Exercises are used to strengthen the anterior and posterior tibialis muscles and flexors of the fingers, exercises with a gradual increase in the load on the feet. The complexes include exercises with objects: grasping small objects with your toes (stones, balls, pencils, beans, etc.) and translating them (picking up a soft cloth rug with your toes, skating with the soles of a stick, etc.). To consolidate the correction use special types of walking - on the toes, heels, the outer surface of the feet, with a parallel setting of the feet. Correcting the position of the heel also contribute to walking on a sloping surface, ribbed board. Part of the special exercises should be performed in a fixed position of the metatarsal heads on the floor surface, in which the tension of the flexors of the fingers does not lead to their bending, but to increase the height of the longitudinal arch. All special exercises are included in the lessons together with the general developmental ones with increasing dosage and are combined with exercises for upbringing the correct posture.

In the final period to therapeutic and morning hygienic gymnastics add therapeutic walking, health training, hydroxychemotherapy and sports-applied exercises. They use freestyle swimming, moving and sports games, cycling, skiing, ice skating, and close hiking. However, limit exercises with weights in the starting position while standing, jumping exercises.

Here are special exercises that are recommended for use in exercise classes with flat feet in different starting positions.

Lying on your back:

1. Alternate and simultaneous stretching of the toes with their simultaneous supination.

2. Bend your legs, rest your feet on the floor. Breeding and erection of heels. After a series of movements - relaxation.

3. Alternate and simultaneous slight lifting of the heels from the support.

4. Legs bent at the knees and spread apart, feet touching each other with soles. Withdrawal and reduction of heels with emphasis on the toes.

5. Put the leg bent at the knee on the knee of the second, half-bent, leg. Circular movements of the foot in both directions. The same, changing the position of the legs.

6. Sliding movements of the foot of one foot on the shin of the other, "covering" the shin. The same with the other foot.

Sitting:

1. Legs bent, feet parallel. Simultaneous and alternate raising of heels.

2. Simultaneous and alternate dorsiflexion of the feet.

3. Lifting the heel of one foot with simultaneous dorsiflexion of the foot of the other leg.

4. Legs straight. Bending and relaxing the feet.

5. Put one foot on the knee of the other foot.

6. Capturing small objects with your toes and moving them to another place.

7. Sitting in Turkish, bend your toes. Leaning forward, stand with support on the back of the feet.

8. Sitting at the back, spread your knees and pull your feet up to your buttocks.

Standing:

1. Feet parallel to the width of the foot, hands on waist. Climb on your toes at the same time and alternately. Raise your toes resting on your heels at the same time and alternately. Rolling from heel to toe and vice versa.

2. Semi-squats and squats on toes, hands to the sides, up, forward.

3. Foot parallel. Rolling on the outer edges of the foot and vice versa.

4. Socks together, heels apart. Half squats and squats combined with hand movements.

5. Stand parallel, hands on waist. Alternate raising of heels.

6. Standing on a gymnastic stick, feet parallel. Half squats and squats in combination with hand movements.

7. Standing on the rail of the gymnastic wall, grab your hands at chest level, squats and squats.

8. Standing on the rail of the gymnastic wall. Lifting on socks and returning to starting position.

9. Standing on a stuffed ball. Squats combined with hand movements.

In motion:

1. Walking on toes.

2. Walking on the outer edges of the feet.

3. Walking in the position of the sock inward, heels outward.

4. Walking in the position of the socks inward, heels outward, with alternate lifting on the socks.

5. Walking on toes on half-bent legs.

6. Walking on toes with high knees.
7. Sliding steps with simultaneous bending of the fingers.
8. Walking on a ribbed board.
9. Walking down a sloping surface.
10. Walking on your toes up and down a sloping surface.

Therapeutic massage is performed for 1.5-2 months during the entire period of treatment of flat feet to: eliminate or reduce pain in deformed feet, muscles of the extremities and improve blood and lymph circulation in them; improving the contractility and strength of the leg muscles and strengthening the ligaments of the feet; normalization of the arch of the feet; increase the overall tone of the body. They use classic massage and self-massage, which start with the shin in a supine position. Massage the muscles of the inner and outer side, then the back of the foot, and then move to the sole, using stroking, rubbing, kneading, tapping. Then return to massaging the leg muscles and then the feet. The duration of the massage is 8-12 minutes, it is recommended to repeat it twice a day.

Physiotherapy is prescribed simultaneously with other means of physical rehabilitation. its task: to eliminate pain, improve blood circulation and trophic tissues of the foot and leg; strengthen the neuromuscular and ligaments of the foot; harden the body. Diadynamotherapy, electrical stimulation of the tibialis muscle and long muscle - extensor digitorum, warm foot baths, rubbing, dousing, bathing, sunbathing and air baths are used.

The effectiveness of physical rehabilitation for flat feet is manifested in the reduction or complete disappearance of unpleasant sensations and pain during prolonged standing and walking, eliminating the defect of the feet, normalizing posture and gait, improving physical performance.

In general, flat feet, especially the most common static flat feet, should be prevented using a variety of items, devices, and equipment. It is necessary to begin with early childhood. Physical education should include special exercises to form and strengthen the arches of the foot, encourage periodic walking barefoot on the floor, loose soil, sand, pebbles. Contributes to the prevention of flat feet wearing shoes with firm soles, small heels and lacing, a rational motor regime, and most importantly - regular exercise and sports.

TESTS FOR CONTROL

1. What is the name of the science that studies the connection of bones?
A. syndesmology
B. osteology
C. rheumatology
D. anatomy
E. arthrology

2. How many mandatory structures does each joint have?
A. 4
B. 1
C. 3
D. 2
E. 5

3. Joints are structurally divided into:
A. compositae, multiple, bifurcated
B. simplices, elliptical, unaxide,
C. unaxide, divise, multiple
D. complexae, combinatae, simplices, compositae
E. bifurcated, elliptical, saddle-shaped joints

4. Joints by function are divided into:
A. simple, complex, combined
B. cup-shaped, spherical, flat
C. multiaxial, complex, flat
D. uniaxial, biaxial, multiaxial
E. simple, combined, spherical

5. Uniaxial joints in shape include:
A. bifurcated joints, elliptical joints, saddle joints
B. cylindrical, block-shaped and their variety - helical
C. spherical, cup-shaped joints
D. cup-shaped joints, saddle joints, spherical
E. saddle joints, cup-shaped joints, spherical

6. Biaxial joints include:
A. bifurcated, elliptical joints, saddle joints
B. simple, complex, combined, complex
C. cup-shaped, spherical, flat
D. saddle joints, flat, cup-shaped
E. cup-shaped, complex, spherical

7. To the triaxial joints; biaxial joints include:
A. cylindrical, block-shaped and their variety - helical
B. bifurcated, elliptical, bifurcated
C. cup-shaped, saddle, bifurcated
D. flat (planae), which may be immobile, spherical, cup-shaped
E. block-shaped and their variety – helical, bifurcated, elliptical

8. The basic law of the system of compounds of arthrosyndesmology is:
A. the smaller the congruence of the articular surfaces, the greater the amount of movement in such a joint
B. the greater the congruence of the articular surfaces, the greater the amount of movement in such a joint
C. the greater the congruence of the articular surfaces, the smaller the amount of movement in such a joint.
D. all answers are correct
E. there is no correct answer

9. Osteokinematics is:
A. the doctrine of the movement of articular surfaces
B. the doctrine of bone movements in space
C. the science that studies bone connections
D. all answers are correct
E. there is no correct answer

10. To describe the movements in the joints in anatomy use three main axes:
A. transverse, horizontal, sagittal
B. frontal, transverse, vertical
C. sagittal, frontal and vertical
D. frontal, horizontal, sagittal
E. horizontal, vertical, transverse

11. Arthrokinematics is:

A. the doctrine of bone movements in space
A. the science that studies bone connections
B. the doctrine of the movement of articular surfaces
C. all answers are correct
D. there is no correct answer

12. Three main components of the movement of articular surfaces:

A. sliding, torsion, rotation
B. rolling, twisting, bending
C. rolling, torsion, bending
D. twisting, bending, sliding
E. torsion, sliding, rolling

13. The specific additional movement against the direction of force of the muscles passing through the joint is:

A. extraction
B. slip
C. rotation
D. reversal
E. diving

14. How many stages of joint extraction are there?

A. 2
B. 4
C. 1
D. 3
E. 5

15. The set of additional movements used to diagnose and treat hypomobility is called

A. active game
B. bone game
C. joint play
D. all answers are correct
E. there is no correct answer

16. Types of forces acting on the body or within it:

A. stretching, compression, displacement, bending, twisting
B. pulling, sliding, rotating
C. torsion, sliding, rolling
D. compression, displacement, rotating, rolling
E. sliding, displacement, twisting

17. Forces acting in different directions along one line: bones, tendons, capsules, ligaments. May cause ruptures:

A. compression
B. offset
C. stretching
D. all answers are correct
E. there is no correct answer

18. What type of force acting on or within the body is said: forces acting in the opposite direction along one line. At compression fractures occur compression fractures (vertebrae, lower extremities), when compressing soft tissues – bruises?

A. compression
B. twisting
C. offset
D. all answers are correct
E. there is no correct answer

19. What type of force acting on or within the body is said: the action of forces in opposite directions along different lines. Such forces can damage the knee ligaments?

A. bending
B. twisting
C. stretching
D. sliding
E. offset

20. What type of force acting on or within the body is said: the force, or forces acting with the lever. When exposed to bones, fractures occur, in children - marginal fractures?

A. twisting
B. stretching
C. sliding
D. bending
E. offset

21. What type of force acting on or within the body is said: spiral movement: spine, legs. The action of this force causes bone fractures, ruptures of soft tissues (knee ligaments, capsule, meniscus)?

A. twisting
B. compression
C. offset
D. stretching
E. sliding

22. What type of muscle contractions are we talking about: contractions of muscles or muscle groups that produce effort that does not change the length of the muscles themselves and the angle in the joints through which they pass?

A. isokinetic stress
B. isotonic voltage
C. concentric stress
D. isometric voltage
E. eccentric stress

23. What type of muscle contraction is it: contraction of a muscle or muscle group at which the movement of the mixing segment has a constant speed?

A. isometric voltage
B. isotonic voltage
C. isokinetic stress
D. concentric stress
E. eccentric stress

24. What type of muscle contraction is it: a contraction of a muscle or muscle group in which muscle tone is constant?

A. isokinetic stress
B. isometric voltage
C. concentric stress
D. eccentric stress
E. isotonic voltage

25. What type of muscle contraction is this: a contraction of a muscle or muscle group that brings the points of attachment of the muscle closer together or reduces its length?

A. concentric stress
B. isotonic voltage
C. isokinetic stress
D. isometric voltage
E. eccentric stress

26. What type of muscle contraction is it: a contraction of a muscle or muscle group that removes the attachment points of a muscle or increases its length?

A. concentric stress
B. isotonic voltage
C. eccentric stress
D. isokinetic stress
E. isometric voltage

27. Joint rigidity - the presence of minor movements in the joint in the range

A. 3-5°
B. 5-10°
C. 10-15°
D. 15-20°
E. 20-30°

28. What type of contractures are classified according to the classification of contractures: due to muscle tissue damage - muscle shortening due to congenital or acquired pathology?

A. myogenic
B. neurogenic
C. tendogenous
D. desmogenic
E. dermatogenic

29. What kind of contractures are we talking about according to the classification of contractures: due to joint damage?

A. neurogenic
B. tendogenous
C. arthrogenic
D. desmogenic
E. dermatogenic

30. What kind of contractures are we talking about according to the classification of contractures: due to scarring of the skin after surgery or wounds?

A. arthrogenic
B. neurogenic
C. tendogenous
D. dermatogenic
E. desmogenic

31. What type of contractures are classified according to the classification of contractures: due to scarring of ligaments, fascia, aponeurosis after surgery or wounds?

A. desmogenic
B. dermatogenic
C. arthrogenic
D. neurogenic
E. tendogenous

32. What kind of contractures are we according to the classification of contractures: due to shortening of the tendon or its fusion with the vagina after injury or tendosynovitis?

A. desmogenic
B. dermatogenic
C. arthrogenic
D. tendogenic
E. neurogenic

33. What kind of contractures are we talking about according to the classification of contractures: due to disorders of the nervous system?

A. tendogenous
B. desmogenic
C. neurogenic
D. dermatogenic
E. arthrogenic

34. Which of the stages of deforming osteoarthritis is in question: joint function is not impaired or with minor limiting the amount of movement. Minor transient pain?

A. 1
B. 2
C. 3
D. 4
E. 5

35. Which of the stages of deforming osteoarthritis is in question: joint function is impaired, movements in the joint are often accompanied by a rough crunch?

A. 1
B. 2
C. 3
D. 4
E. 5

36. Which of the stages of deforming osteoarthritis is in question: movements are sharply limited, the affected joint is in a forced position?

A. 1
B. 2
C. 3
D. 4
E. 5

37. The characteristic signs of osteoarthritis are not:

A. morning stiffness
B. starting pain
C. the mechanical nature of the pain syndrome
D. crunch in the joint
E. blockade of the joint

38. For deforming osteoarthritis in the initial stage of the disease, symptoms are not characteristic:

A. constant aching pain
B. pain at the beginning of walking
C. night pains
D. pain after prolonged exercise
E. pain during physical exertion

39. Signs of primary osteoarthritis are:

A. pain in the joints during exercise
B. periodic "jamming" of the joint
C. less pain at rest
D. development of joint deformity
E. all answers are correct

40. To factors that do not predispose the deposition of salts in the joints and periarticular tissues include:

A. hypothermia
B. insufficient blood supply
C. too much movement
D. hypokinesia
E. all answers are correct

41. What laboratory parameters are typical for osteoarthritis?

A. anemia
B. leukopenia
C. leukocytosis
D. normal values blood
E. increased erythrocyte sedimentation rate

42. What is the radiographic picture of osteoarthritis?

A. osteophytosis
B. narrowing of the joint space
C. osteosclerosis
D. correct answer A, C
E. all answers are correct

43. The main clinical symptoms of severe coxarthrosis are not:

A. constant pain in the joint, aggravated by walking
B. adduction contracture of the joint
C. hypotrophy of the thigh muscles
D. decreased pulsation of the femoral artery, hip shortening.
E. joint pain during exercise

44. Bouchard's nodules are a manifestation of arthrosis of which joints?

A. proximal interphalangeal joints of the hand
B. distal interphalangeal joints of the hand
C. knee joints
D. first metatarsophalangeal joint
E. shoulder

45. With primary osteoarthritis:

A. the disease begins slowly, for no apparent reason
B. the joints of the legs are mainly affected and distal interphalangeal joints
C. the disease leads to permanent deformity of the joints
D. 1 metatarsophalangeal is predominantly affected joint
E. all answers except D are correct

46. Physical exercises for diseases of the joints impede development
A. fibrous degeneration of muscles
B. wrinkling of joint capsules
C. articular cartilage atrophy
D. all answers are correct
E. correct answer A, B

47. In case of exacerbation of deforming osteoarthritis, the following is applied:
A. limb unloading
B. exercise therapy and massage
C. anti-inflammatory and analgesic drugs
D. antibiotic therapy
E. all answers except D are correct

48. Exercises in warm water in diseases of the musculoskeletal system contribute to everything except:
A. pain relief
B. elimination of muscle spasm,
C. weight loss
D. improve joint mobility
E. muscle strengthening

49. Underwater massage in the subacute period of osteoarthritis is performed with the following indicators of water measurements:
A. at a water temperature of 36 °, with a pressure of 1-1.5 atmospheres
B. at a water temperature of 30 °, with a pressure of 1-1.5 atmospheres
C. at a water temperature of 40 °, with a pressure of 1.5-2 atmospheres
D. at a water temperature of 36 °, with a pressure of 3--3.5 atmospheres
E. at a water temperature of 37 °, with a pressure of 2-4 atmospheres

50. Therapeutic gymnastics in the period of remission of osteoarthritis is carried out by
A. 30 - 40 minutes daily, in small groups
B. 30 - 40 minutes daily, on your own
C. 40 - 50 minutes 2 times a week, small group method
D. 40-50 minutes 2 times a week, independent method
E. 10-15 minutes daily, in small groups

51. In which planes can there be posture defects?
A. sagittal and frontal:
B. frontal and horizontal
C. vertical and sagittal
D. horizontal and vertical
E. horizontal and frontal

52. Asymmetrical posture refers to posture defects in:
A. sagittal plane
B. frontal plane
C. horizontal plane
D. vertical plane
E. there is no correct answer

53. Slouching, round back, round concave back - belong to the defects of posture:
A. frontal plane
B. horizontal plane
C. sagittal plane
D. vertical plane
E. all answers are correct

54. How many degrees of scoliosis are distinguished depending on the severity of the disease?
A. 3
B. 2
C. 4
D. 5
E. 6

55. According to the place of formation of the primary arc scoliosis is divided into:
A. straight, curved, arcuate
B. left-handed and right-handed
C. thoracic, lumbar-thoracic and lumbar
D. horizontal and vertical
E. all answers are correct

56. To what degree are the following features: the angle of deviation of the primary arc is about 10°, the ridge resembles the letter C?
A. I
B. II
C. III
D. IV
E. V

57. To what degree are the following signs: the appearance of an additional compensatory arc of curvature, resulting in the spine takes the form of the Latin letter S, the angle of deviation of the main arc reaches 30°?

A. I
B. II
C. III
D. IV
E. V

58. To what degree are the following features: the presence of at least two arcs, the angle of deviation of the main arc is 30-60°?

A. I
B. II
C. III
D. IV
E. V

59. To what degree are the following signs characteristic: kyphoscoliosis is observed, the angle of deviation of the spine from the vertical axis is more than 60°?

A. I
B. II
C. III
D. IV
E. V

60. At suspicion on what disease apply Chizhin's method?

A. scoliosis
B. osteoarthritis
C. flatfoot
D. defects set
E. coxarthrosis

Correct answers to tests: 1-E; 2-A; 3-D; 4-D; 5-B; 6-A; 7-D; 8-C; 9-B; 10-C; 11-B; 12-E; 13-A; 14-D; 15-C; 16-A; 17-C; 18-A; 19-E; 20-D; 21-A; 22-D; 23-C; 24-E; 25-A; 26-C; 27-A; 28-A; 29-C; 30-D; 31-A; 32-D; 33-C; 34-A; 35-B; 36-C; 37-A; 38-A; 39-E; 40-C; 41-D; 42-E; 43-D; 44-A; 45-E; 46-D; 47-E; 48-C; 49-A; 50-A; 51-A; 52-B; 53-C; 54-C; 55-C; 56-A; 57-B; 58-C; 59-D; 60-C.

RECOMMENDED LITERATURE

Basic

1. Bases of physical rehabilitation in medicine / A. V. Mahlovanyy [et al.]. - Lviv, 2019. - 70 p.

2. Physical Rehabilitation / eds.: S. B. O'Sullivan, T. J. Schmitz, G. Fulk. - 7th ed. - Philadelphia : F. A. Davis Company, 2019. - XXI, 1476 p. : il.

Additionally

1. Physical rehabilitation, sports medicine: a textbook for students. higher med. teach. institutions / V.V. Abramov, V.V. Klapchuk, O.B. Nehanevych [et al.]; 23 Ed. Professor Vladimir Abramov and associate professor O.L. Smirnova. - Dnepropetrovsk, Zhurfond, 2014. - 456 p. : Ill. 79.

2. Homola, A. V. Physical therapy for patients after stroke / A. V. Homola, Ye. V. Prokopovych, Y. V. Antonova // Art of Medicine. - 2021. - N 1. - C. 18-26.

3. Manual of physical medicine and Rehabilitation. - Philadelphia : Hanley @ Belfus, 2002. - 512 p.

4. Physical Medicine And Rehabilitation Secrets / ed. Bryan J. O'Young. - Philadelphia : Hanley & Belfus, 2002. - 626 p.

5. Manual of Physical Medicine and Rehabilitation / ed. Christopher M. Brammer. - Philadelphia : Hanley & Belfus, 2002. - 511 p.

6. Mikhalyuk E. L. Physical rehabilitation in internal medicine : study book / E. L. Mikhalyuk, A. A. Cherepok, S. N. Malakhova. - Zaporozhye : ZSMU, 2014. - 74 p.

7. Mikhalyuk E.L., Cherepok A.A., Malakhova S.N. Sports medicine and medical physical training: basic concepts of exercise physiology and exercise prescription. Study book, Zaporizhzhia, 2014. – 89 p.

8. Sports medicine and physical rehabilitation / V. F. Moskalenko [et al.] ; ed.: V. F. Moskalenko, V. A. Shapovalova. - Kiev : Book-plus, 2010. - 168 p.

Наукове видання
(на англійській мові)

Івченко Анна Олексіївна
Канигіна Світлана Миколаївна
Черепок Олександр Олексійович

REHABILITATION OF DISEASES AND LESIONS OF THE MUSCULOSKELETAL SYSTEM

Study manual for 4th year medical students studying the discipline "Physical Rehabilitation and Sports Medicine"

Редактор Т.І. Чуб
Технічний редактор М.І. Синюгін

Підписано до друку 09.01.2023 р.
Папір офсетний. Друк - ризограф.
Умов. друк. арк. 4,0
Наклад 50 прим. Зам. № 9578.
Оригінал-макет виконаний в ЦВЗ ЗДМУ
69035, г. Запоріжжя, пр-т Маяковського 26,
тел. (061) 239-33-01

Видавництво ЗДМУ
69035, Запоріжжя, пр. Маяковського, 26