



Increase the Effectiveness of Prevention and Treatment of Osteoporosis

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Abstract: Osteoporosis is a chronic disease of the bones of the skeleton, which is associated with metabolic disorders, is manifested by a progressive decrease in density and a violation of the structure of bone tissue and leads to fractures with minimal trauma (for example, when falling from a height of one's own height).

Keywords: osteoporosis, disease, patients, bone system, physical activity, diagnosing and treatment.

This disease is so urgent that the World Health Organization has named osteoporosis the fourth cause of morbidity and mortality from chronic non-communicable diseases.

Osteoporosis is a "silent epidemic": less than 1% of patients know about their illness. As a result, seven vertebral fractures occur every minute in our country, and every five minutes - one fracture of the femoral neck, which are associated with osteoporosis. Depending on the causes, primary and secondary osteoporosis is distinguished. Primary osteoporosis occurs in 85% of cases. It is divided into four types.

1. Postmenopausal:

- ✓ occurs in women with estrogen deficiency;
- ✓ characterized by a phase of accelerated bone loss,
- ✓ primarily from the trabecular bone;
- ✓ Fractures of the bones of the distal forearm are characteristic and phone calls.

2. Senile (senile):

- ✓ occurs in women and men due to bone loss with age;
- ✓ fractures of the cortical and trabecular bones appear;
- ✓ fractures of the bones of the distal forearm are characteristic,
- ✓ Vertebral bodies and femoral neck.

3. Juvenile:

- ✓ occurs in children or young people of both sexes with normal function of the genital glands;
- ✓ starts at 8-14 years old;
- ✓ sharp pain and/or fracture after injury is characteristic.

4. Idiopathic (arising independently): • the causes of development are unknown.

Secondary osteoporosis is less common - in 15% of cases. There are nine reasons for its occurrence:

1. Genetic disorders: renal hypercalciuria - one of the most important secondary causes of osteoporosis; Gaucher's disease; cystic fibrosis; osteogenesis imperfecta ("crystal bones"); glycogen disease (accumulation of glycogen); Marfan syndrome; Ehlers-Danlos syndrome ("hyperelasticity of the skin"); homocystinuria (impaired methionine metabolism); porphyria (serious violation of pigment metabolism).
2. Conditions accompanied by hypogonadism (violation of the function of the genital glands): anorexia nervosa and bulimia; sports amenorrhea (menstruation disorder associated with intense training); insensitivity to androgens; hyperprolactinemia; ovariectomy (removal of ovaries); panhypopituitarism (lack of somatotrophic hormone due to adenohypophysis insufficiency); premature menopause (under 40 years); Turner syndrome (sex chromosome anomaly); Klinefelter syndrome (violation of puberty of boys associated with the appearance of an extra X chromosome).
3. Endocrine disorders: Itsenko - Cushing's disease; type 1 and type 2 diabetes mellitus; thyrotoxicosis; hypogonadism; acromegaly (increase in the amount of growth hormone); adrenal insufficiency; estrogen deficiency; pregnancy; prolactinoma (benign pituitary tumor).
4. Deficient conditions: calcium, magnesium, protein, vitamin D deficiency; surgical treatment of obesity; celiac disease (gluten intolerance); gastrectomy (gastric removal); malabsorption (insufficient absorption of nutrients in the small intestine); malnourishment (lack of energy and proteins obtained during meals); parenteral nutrition (intravenous introduction of nutrients); primary biliary cirrhosis.
5. Eating disorders: excess vitamin A; excess salt in the diet.
6. Chronic inflammatory diseases: inflammatory bowel pathologies (Crohn's disease, ulcerative colitis); ankylosing spondylitis (Bekhterev's disease); rheumatoid arthritis; systemic lupus erythematosus.
7. Blood diseases: hemochromatosis (impaired iron metabolism); hemophilia (blood clotting disorder) leukemia (cancer affecting blood and bone marrow); lymphoma (cancer of white blood cells); multiple myeloma (tumor consisting of altered plasma blood cells); sickle cell anemia (hereditary blood disease); systemic mastocytosis (excess of mast cells); thalassemia (violation of hemoglobin production); metastatic disease.
8. Taking medications: anticonvulsants; antipsychotic drugs; antiretroviral drugs; aromatase inhibitors; chemotherapeutic drugs; furosemide; prednisone (more than 5 mg per day for three months or longer); heparin (for a long time); hormonal or endocrine therapy: gonadotropin-releasing hormone (GnRH) agonists, luteinizing hormone analogues releasing hormone (LHRH),

depomedroxyprogesterone, excessive doses of thyroxine; lithium; antidepressants (SSRIs); antacids containing aluminum (Almagel); proton pump inhibitors (omeprazole, lansoprazole).

9. Other conditions: alcoholism; amyloidosis (extracellular protein deposition);
10. Chronic metabolic acidosis (increased acidity); chronic heart failure; depression; chronic obstructive pulmonary disease, emphysema (excessive accumulation of air in the lungs); chronic kidney disease, end-stage chronic renal failure; chronic liver pathology; HIV, AIDS;
11. Immobilization (immobility, fixation of a body part); multiple sclerosis; organ transplantation; sarcoidosis; weightlessness.

Symptoms of osteoporosis:

The disease at the initial stages is not accompanied by any manifestations, so most often a patient with this disease goes to the doctor only after a fracture with minimal trauma, which becomes the first sign of osteoporosis.

Typical fracture sites in osteoporosis are:

- ✓ vertebrae - 46%;
- ✓ hip neck - 20%;
- ✓ shoulder and forearm - 15%;
- ✓ other localizations - 19%.

Other symptoms of osteoporosis usually appear after multiple compression fractures in the vertebral bodies. They include the following manifestations:

- ✓ reduced growth;
- ✓ protruding belly;
- ✓ reflux disease (chest pain, heartburn);
- ✓ early satiety when eating;
- ✓ weight loss;
- ✓ restriction of movements;
- ✓ back and hip pain;
- ✓ increasing the distance from the wall to the back of the head, overstretching of the neck, bending;
- ✓ Contact of the ribs with the pelvis.

In addition, it is necessary to pay attention to the presence of symptoms of diseases leading to secondary osteoporosis, which are quite specific for each condition.

Osteoblasts not only form bone tissue and are responsible for its mineralization, but also control bone resorption carried out by osteoclasts.

Osteocytes are cells that are the final form of osteoblast differentiation and are engaged in bone mineralization after bone remodeling is completed.

In osteoporosis, the relationship between osteoclasts and osteoblasts is disrupted, and the ability to continuously restore the trabecular bone in response to ongoing microtrauma is lost. As a result, osteoclasts dissolve bone within weeks, while osteoblasts take months to produce new bone tissue. Thus, any condition that increases the rate of bone remodeling causes bone loss.

The peak of bone mass falls on the third decade of a person's life. With age, its indicator gradually decreases. Therefore, the inability to accumulate optimal bone mass in youth is the main factor contributing to the appearance of osteoporosis. That's why some postmenopausal women show a slight decrease in bone density, while others have osteoporosis.

Nutrition and physical activity in the process of growth and development are also important for the accumulation of bone mass. However, the main role is played by genetic factors, since it depends on them what the possible values of maximum bone mass and strength will be for each individual.

When diagnosing, it is necessary to pay attention to several points:

1. Osteoporosis can develop in people with no or few risk factors for this disease.
2. It is important to detect osteoporosis before the onset of symptoms, that is, before the development of its complications.
3. Even if we have a postmenopausal woman or an elderly patient in front of us, it is necessary to exclude the causes of secondary osteoporosis.

In this regard, screening of the population at risk of osteoporosis plays a very important role.

As a matter of fact, a patient's survey to clarify his complaints, medical history and life, as well as a clinical examination are necessary precisely in order to determine the risks of fractures in the future and exclude other diseases that could lead to osteoporosis.

Currently, the FRAX tool is recommended to assess the 10-year probability of fractures with minimal injury. It is presented as a free resource on the Internet, and any doctor can immediately assess the risks of complications of osteoporosis in his patient at the reception. In particular, this screening is recommended for all postmenopausal women and men over 50 years of age.

Treatment goals:

- ✓ preventing or reducing the number of fractures;
- ✓ increased bone density;
- ✓ Improvement of indicators of markers of bone remodeling.

First of all, to prevent fractures in osteoporosis, it is necessary to observe lifestyle correction measures:

- ✓ weight gain and exercise to strengthen muscles and improve balance;
- ✓ ensuring optimal intake of calcium and vitamin D as a supplement to active therapy.

Medical treatment:

Drug therapy for osteoporosis is prescribed to postmenopausal women and men over the age of 50 in the following cases:

- ✓ fracture of the hip or vertebra;
- ✓ results of the DXA examination - the T-criterion is equal to or less than -2.5 SD for the femoral neck or vertebrae after excluding the causes of secondary osteoporosis;

- ✓ low bone mass (T-criterion between -1.0 and -2.5 SD for hip neck or spine) and a 10-year FRAX probability of 3% or more for hip fracture or 20% or more for major osteoporotic fracture).

Federal clinical guidelines for the diagnosis, treatment and prevention of osteoporosis provide for the use of: [4]

- ✓ antiresorptive drugs - aimed at suppressing bone resorption by acting on osteoclasts (bisphosphonates, denosumab);
- ✓ Anabolic drugs - aimed at strengthening bone formation (teriparatide).

BISPHOSPHONATES. These drugs disrupt the work of osteoclasts, preventing the destruction of bone. Accumulating in the bone tissue, they have a delayed effect with the preservation of the effect for months after the discontinuation of treatment.

Undesirable phenomena. When using bisphosphonates inside, adverse effects from the gastrointestinal tract are possible - difficulty swallowing, esophagitis and gastritis. With intravenous administration of bisphosphonates, a flu-like reaction may occur - an increase in body temperature, joint and muscle pain, weakness, etc. The severity of such symptoms decreases significantly after repeated intravenous injections, and their complete disappearance occurs after 2-3 days. It is possible to facilitate the course of a flu-like reaction with the help of non-steroidal anti-inflammatory drugs. In rare cases, cases of osteonecrosis of the jaw have occurred against the background of prolonged use of bisphosphonates (more than five years).

Contraindications and limitations:

- ✓ hypocalcemia;
- ✓ severe renal impairment (creatinine clearance less than 35 ml/min);
- ✓ violation of mineral metabolism (vitamin D deficiency, osteomalacia, hypophosphatasia, hypophosphatemia);
- ✓ breastfeeding;
- ✓ Children and adolescents under 18 years of age.

Ingestion of bisphosphonates is contraindicated in diseases of the esophagus that violate its patency, the inability of a person to be in an upright position for 30 minutes. These drugs are used with caution in diseases of the gastrointestinal tract in the acute phase.

Application. All preparations of bisphosphonates in the form of tablets (alendronate, risendronate, ibandronate) are taken in the morning on an empty stomach 30 minutes before meals. The tablet is washed down with a glass of water, after which it is necessary to be in an upright position for about 30-40 minutes, without taking food or liquid other than water.

Drugs for intravenous administration are used once every three months (ibandronate) or once a year (zoledronate).

DENOSUMAB. This drug is designed to block the process of attracting active osteoclasts. Unlike bisphosphonates, denosumab reduces the production of osteoclasts, but the function of mature cells is not impaired. The drug does not accumulate in the bone tissue, its effect ceases after treatment. It is safe in case of impaired kidney function.

Denosumab is available in the form of a syringe pen, injected subcutaneously once every six months.

Possible adverse events:

- skin reactions;
- bloating;
- hypocalcemia.

Contraindications:

- hypocalcemia;
- hypersensitivity to the drug;
- Pregnancy or lactation.

TERIPARATIDE. This drug has a predominant effect on osteoblasts, increasing their life expectancy. Thus, it enhances bone formation and activates modeling in individual parts of the skeleton. It is recommended for use by patients with severe osteoporosis and in case of ineffectiveness of treatment with other drugs.

Teriparatide is applied subcutaneously at 20 mg once a day daily, stored in the refrigerator.

Adverse events: dizziness, cramps in the legs.

Contraindications:

- ✓ hypercalcemia;
- ✓ hyperparathyroidism;
- ✓ osteogenic sarcoma;
- ✓ unclosed growth zones;
- ✓ history of skeletal irradiation;
- ✓ pregnancy or lactation;
- ✓ malignant formation of bone tissue or bone metastases;
- ✓ allergic reaction to the drug.

CALCIUM AND VITAMIN D. All drugs aimed at combating osteoporosis should be taken in combination with calcium preparations (500-1000 mg / day) and vitamin D (800-1000 IU / day), since the effectiveness of such a combination has been clinically confirmed. In addition, potentially avoidable causes of secondary osteoporosis are treated if they are detected.

ANALGESICS. Another goal of treating patients with osteoporotic fracture is to control pain, which can be very pronounced with compression fractures of the vertebrae and seriously impairs the quality of life. In this case, painkillers are prescribed, which are taken orally in the form of tablets or capsules as needed or on a regular basis. Physiotherapy and percutaneous electrical stimulation are also used for anesthesia.

A good effect in the treatment of osteoporosis is provided by mechanical support of the spine and, in some cases, orthoses for the thoracic spine (orthopedic corsets). They perform a supporting function, removing part of the axial load from the thoracic and lumbar spine, and restrict movement in the spine. It is recommended to wear an orthosis if the patient intends to walk or stand for more than an hour, but it is important to limit the wearing time, since prolonged immobilization contributes to the demineralization of bones.

Surgical treatment is used for fracture of the femoral neck, as well as for pronounced deformities of the chest that have arisen against the background of multiple compression fractures of the vertebrae.

During the period of rehabilitation after fractures, classes with a specialist in physical therapy (exercise therapy), breathing exercises, exercises to strengthen the pectoral and intercostal muscles are recommended.

With timely detection and treatment of osteoporosis, the prognosis is favorable. At the same time, osteoporotic fractures are accompanied by disability (from temporary to permanent). Therefore, when assessing the forecast, it is necessary to take into account the available statistical data, in order to focus the attention of the population, government bodies and medical workers on preventive measures:

- ✓ Mortality from osteoporotic fractures in the first year is 45-52%.
- ✓ At the same time, every third patient dies in the first three months after the fracture.
- ✓ Of the survivors, 33% remain bedridden, 42% are limited in activity, and only 15% leave the house.
- ✓ Only 9% of patients return to the previous level of activity that was before the fracture.

In this regard, in osteoporosis with a high risk of fractures, it is recommended to limit long-term loads on the musculoskeletal system to reduce the risk of compression fractures of the vertebrae, as well as to limit activities that can lead to falls in order to reduce the risk of fractures of the distal forearm and hip.

Osteoporosis is a chronic disease of the bones of the skeleton, so it cannot be completely cured. However, preventive measures can slow down the decrease in bone density.

Primary prevention of osteoporosis begins in childhood. To create the necessary peak bone mass and bone strength, it is necessary to consume sufficient amounts of calcium and vitamin D and be physically active regularly.

In middle age, prevention of osteoporosis consists in maintaining bone mass, and in older age it is also aimed at preventing falls and early detection and treatment of osteoporosis in order to prevent fractures.

Five steps to the prevention of osteoporosis:

1. Take the recommended amount of calcium and vitamin D every day.
2. Maintain physical activity, improve muscle strength and balance.
3. Avoid smoking and drinking alcohol.
4. Consult your doctor to determine your risk level.
5. Determine the density of bone tissue.

Secondary prevention is a set of measures that are applied when the disease is already established. They are aimed at combating its complications, i.e. at preventing fractures, and include:

1. Training is an important step in controlling your disease.
2. Physical activity - helps to improve coordination, muscle strength, increase bone density.
3. Diet and nutrition rules - a variety of diet, sufficient protein intake, enrichment of nutrition with calcium and vitamin D.
4. Giving up bad habits - avoid smoking and drinking alcohol.

5. Measures to achieve the safety of the patient - vision control, ensuring the safety of the house (good illumination, uncluttered passages, the use of non-slip mats, the presence of handrails in the bathroom, the location of the necessary things within reach) to prevent falling.

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