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X-RAY Diagnosis, Symptoms and Treatment of Aseptic Necrosis of the Femoral Head

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Abstract: ***Aseptic necrosis of the femoral head is the necrosis of areas of the bone marrow of the femoral head with the development of local osteoporosis and osteonecrosis due to circulatory disorders. It manifests itself as increasing pain, limitation of movements, dysfunction of the hip joint. May cause disability for the patient. Diagnosed on the basis of complaints, objective examination data, results of radiography, CT, MRI and scintigraphy. During the treatment process, drug therapy, physiotherapy, exercise therapy, orthopedic measures, and corrective osteotomy are used. If there is significant destruction of the head, endoprosthetics is performed.***
Keywords: bone marrow, femoral head, radiography, X-ray diagnosis, drug therapy, physiotherapy, exercise therapy.

I. INTRODUCTION

Aseptic necrosis of the femoral head (AFH) in adult patients was first described as an independent disease in the late 30s of the last century. Some researchers tried to combine this pathology with Perthes disease in children, but it was subsequently found that in childhood necrosis occurs much more favorably. The disease is most often detected at the age of 25-40 years, in half of the cases it is bilateral. In 15% of patients, similar aseptic lesions of other epiphyses of long tubular bones (humeral head, femoral condyles) are found. The male to female ratio is approximately 8:1.

II. LITERARY REVIEW AND METHODOLOGY

Aseptic necrosis of the femoral head is considered as a polyetiological disease. The immediate cause of destruction of the femur is local tissue ischemia as a result of thrombosis against the background of circulatory disorders due to vascular pathology or external compression. The main factors causing the formation of a blood clot are: Intoxication. According to scientists, 65% of the total number of cases of ANFH is caused by alcoholism and prolonged use of glucocorticoid and chemotherapy drugs.
Radiation injuries: radiation sickness, radiation therapy.
Diseases of the hematopoietic system.
Vascular pathology: atherosclerosis.
Connective tissue diseases.
Internal diseases: pancreatitis, renal failure, liver failure, Cushing's syndrome.
Other reasons: organ transplantation, cancer, decompression sickness, allergic reactions. The proportion of aseptic necrosis that occurs for unknown reasons (idiopathic) ranges from 15 to 20%.

III. PATHOGENESIS

The trigger for the development of aseptic necrosis is a significant deterioration or complete cessation of local blood circulation, causing the death of a section of bone marrow tissue. Swelling forms around the area of necrosis. The recovery process begins, however, due to ongoing disturbances in blood flow caused by paresis or spasm of small vessels, local congestion and aggregation of cellular components of the blood, repair is ineffective. The area of necrosis does not decrease, but spreads to neighboring areas. Due to edema, aseptic inflammation, vasodilation and venous stasis, intraosseous pressure increases, which further aggravates existing disorders. The subchondral parts of the head are involved in the process, a zone of osteoporosis is formed, and then osteonecrosis.

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A decrease in the mechanical strength of the bone causes impression microfractures, which, in turn, lead to a further decrease in the strength of bone tissue. Due to malnutrition and lack of adequate support on bone structures, hyaline cartilage during aseptic necrosis is quickly destroyed and replaced by fibrous tissue.

The further course of the disease is largely determined by the location of the affected area. When the upper outer zone is involved, the process usually continues to progress, ending with the collapse of the head and rapidly developing severe coxarthrosis. With necrosis of the medial areas with less load, spontaneous recovery is observed in some cases.

IV. CLASSIFICATION

The most rational from a practical point of view is the classification of necrosis of the femoral head, taking into account the stage of development of the pathology. This approach allows you to clarify the prognosis, choose the optimal medical tactics, and determine the need and type of surgical intervention. It is taken into account that aseptic bone necrosis is a dynamic process without a clearly defined moment of transition from one stage to another. Specialists in the field of traumatology and orthopedics have developed several options for systematizing aseptic necrosis, including from 3 to 7 stages. In Russia, the classification proposed by S. A. Reinberg and based on the features of the x-ray picture is usually used:

1) Stage 1 (pre-X-ray). There are no radiological changes. It may be asymptomatic or accompanied by pain, muscle atrophy and limitation of movement. The results of histological examination indicate the presence of local necrotic changes in the bone marrow and spongy substance.
2) Stage 2 (impression fractures). The x-ray reveals a homogeneous darkening, absence of a structural pattern in the affected area, local compactions and a decrease in the height of the head, widening of the joint space. A large number of microfractures are detected.
3) Stage 3 (sequestration). The head becomes even flatter, loses its normal contours, and the joint space continues to expand. The images visualize individual bone fragments of various sizes and shapes that do not have a normal structure. Thickening and shortening of the femoral neck is determined.
4) Stage 4 (reparation). The fragmentation of bone substance disappears. The femoral head is normally contoured, but its structure has not yet been restored. Cyst-like foci of clearing are sometimes visible in the bone substance.
5) Stage 5 (deforming arthrosis). The bone structure is restored, the deformation of the head that arose in stages 2 and 3 remains. The head is flat, widened, and does not coincide in shape with the glenoid cavity. Osteophytes are visible on its surface, and cystic cavities are revealed in the bone, formed against the background of degenerative processes.

A. *Symptoms*

The clinical picture of aseptic necrosis can form gradually or develop suddenly; a bilateral process is characterized by a more rapid progression of symptoms compared to a unilateral one. The first manifestation is pain in the groin area, less often in the femur or lumbosacral area, not accompanied by swelling, local or general hyperthermia.

At first, the pain syndrome occurs periodically, then it becomes constant, its severity increasingly intensifies. At stage 3, night pain is possible. Sometimes the intensity of pain is so great that patients with aseptic necrosis completely lose the ability to support and walk for several days. After a short-term increase in symptoms, the symptoms subside, and patients return to their usual exercise regimen.

Movement problems worsen over months or years. Initially, the volume of rotation is reduced and abduction is limited. Subsequently, the range of motion during flexion and extension of the hip decreases. As the disease progresses, atrophic changes in the thigh and gluteal muscles increase. Upon examination, a decrease in the volume of the thigh and flattening of the buttock are determined. The total duration of the disease is 1.5-2 years.

B. *Complications*

The severity of residual effects after completion of repair can vary significantly. As a result, contracture with a forced position and shortening of the limb is possible. With bilateral lesions, severe coxarthrosis is often detected, accompanied by significant impairment of the function of support and movement. These disorders cause disability in patients and require extensive surgical interventions.

C. Diagnostics

Diagnosis of aseptic necrosis of osteoarticular structures is carried out by orthopedic doctors. Previously, the main method was x-ray examination, which did not allow detecting early pathological changes. Currently, along with traditional radiography, modern methods are used to make a diagnosis, the sensitivity of which at an early stage reaches 90-100%. The examination plan includes the following imaging methods:

X-ray of the hip joint. To increase the information content, special layouts according to Launstein are used. Initially, the images show areas of reduced density under the subchondral bone, giving the superficial parts of the head an “eggshell” appearance. Then the deformation of the head and the necrotic focus become visible in the form of a dense shadow surrounded by a lighter rim. The outcome visualizes changes characteristic of deforming arthrosis. CT scan of the hip joint. At the initial stage, when performing a diagnostic procedure, violations of the structure and density of bone matter are determined. Subsequently, a necrotic defect is discovered. The method allows you to clarify the size and exact location of the focus of bone destruction identified on x-rays.

D. Scintigraphy

When conducting a static study, hyperfixation of the radiopharmaceutical in the lesion is noted. The intensity of accumulation depends on the activity of the process and the degree of blood supply disturbances. Dynamic scintigraphy at the initial stages indicates an increase, and at later stages a decrease in all phases of blood flow.

E. Differential Diagnosis

Differential diagnosis of aseptic damage to the head is carried out with deforming arthrosis of the hip joint, osteochondrosis, tuberculous coxitis, post-traumatic osteodystrophy. To exclude osteochondrosis, X-ray data of the spine are used. If a tuberculosis process is suspected, tuberculin tests are performed and radiography of the OGK is prescribed.

To distinguish between aseptic necrosis, arthrosis and osteodystrophy, intraosseous pressure is sometimes measured: with coxarthrosis it is reduced compared to the norm, with osteodystrophy there is a slight or moderate increase, with necrosis there is a marked increase in the indicator. Treatment of aseptic necrosis of the femoral head. Depending on the stage of the process and the severity of pathological changes, treatment of aseptic necrosis in the area of the femoral head can be conservative or surgical, carried out on an outpatient basis or in an orthopedic hospital. Etiotropic effects involve eliminating or reducing the influence of factors that provoked necrotic changes in the femoral head.

F. Orthopedic Mode

It is recommended to change the load on the hip joint. Opinions regarding the duration of use of additional devices vary among specialists. Some orthopedists suggest long-term unloading of the joint for up to six months. Others point to a high likelihood of subsequent muscle atrophy, limitation of movement and disturbance of the motor pattern.

In the treatment option with early activation, patients are recommended to use crutches or a cane for 3-4 weeks, and then refrain from inertial loads (running, jumping) and follow a regimen of dosed physical activity, including short walking, exercise on an exercise bike, and special exercise therapy complexes.

G. Conservative Treatment

Drug and non-drug therapy is used. Medicines are prescribed in long courses. The treatment plan for aseptic necrotic lesions includes:

Normalization of blood circulation. In the early stages, pathogenetic treatment is carried out, which involves the prescription of vascular agents for up to 3 months to eliminate ischemia, restore the rheological properties of the blood, and prevent the formation of microthrombi.

Anesthesia. To eliminate pain, periarticular blockades are performed and NSAIDs of general and local action are used.

Restoration of bone tissue. Calcium supplements are used in combination with medications containing etidronic acid for 8 months. The conservative therapy program is supplemented with short courses of chondroprotectors at intervals of 6-12 months. At stages 3 and 4, vitreous humor and oxygen are injected into the joint. Physiotherapy includes laser therapy and EHF. It can be carried out in early and late periods. The goal of early interventions is to minimize destruction of the femoral head and prevent the development of complications. In the long-term period, methods are used aimed at correcting persistent disorders. Interventions on the femoral head. To prevent head collapse, early decompression of the affected area will be performed.

The most effective type of decompression is considered to be tunnelization, which involves removing one or two cylindrical sections with a diameter of up to 10 mm and replacing them with an autograft or allograft.

Operations on the underlying sections. Another way to reduce the load on the affected area is corrective osteotomy in the intertrochanteric zone of the femur, which is also performed in the early period of the disease. Restoring limb function. If the head collapses, joint replacement is required. If there are contraindications to the installation of an endoprosthesis, arthrodesis with fixation of the joint in a functionally advantageous position is indicated. The tactics of postoperative patient management are determined by the timing and type of intervention. After decompression, a regimen based on the stage of the disease is recommended. After endoprosthetics, early activation is used, walking with crutches is indicated for 2 months. After arthrodesis, immobilization is required for 3-4 months. The prognosis for necrotic lesions of the femoral head is determined by the volume, location and bilateral or unilateral nature of the lesion. The most unfavorable outcome is observed with bilateral necrosis of the superolateral parts of the head - after completion of the repair process, a significant impairment of movements in the joint is often observed, the supporting function is significantly affected, and disability occurs.

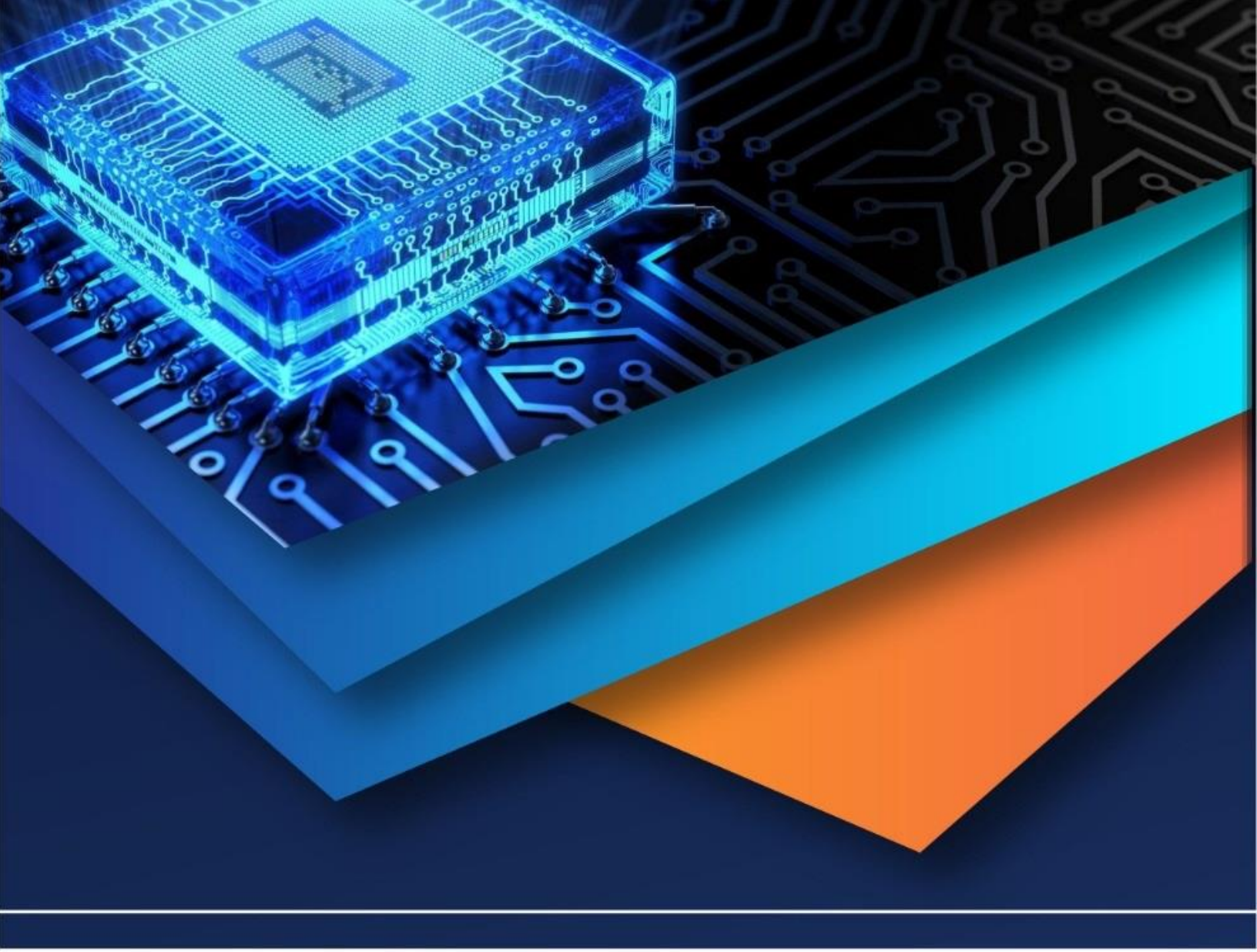
With unilateral aseptic necrosis of the internal zone, residual effects are less pronounced, and the ability to work is often preserved. After endoprosthetics, the range of motion and support of the limb are restored. After arthrodesis, persistent disability is noted, there is no movement in the joint. Primary prevention measures include eliminating or minimizing the impact of provoking factors. It is necessary to stop drinking alcohol and control the duration of taking glucocorticoids. It is important to prevent injuries to the hip joint and carry out timely treatment of diseases that contribute to the development of necrosis.

V. CONCLUSION

Prevention of the negative consequences of the pathology includes a thoughtful regimen of physical activity according to the period of the disease, timely decompression to prevent collapse of the femoral head. To prevent the development of disabling complications, patients should follow the doctor’s recommendations regarding the use of special means and do not overload the affected limb.

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