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Optimization of Diagnosis and Treatment of Acute Epiphyseal Osteomyelitis in Children

Atakulov Zhamshed Ostonokulovich[1], Yusupov Shukhrat Abdurasulovich[2], Bayzhigitov Nusratilla Isrofilovich[3], Davronov Bobir Latibovich[4], Makhmatkulov Homidullo Gaibullaevich[3], Foziljon-Zoda Maftuna[5]

[1]Doctor of Medical Sciences, Professor of the Department of Pediatric Surgery No. 1 of the Samarkand State Medical Institute
[2]Doctor of Medical Sciences, Professor, Head of the Department of Pediatric Surgery No. 1 of the Samarkand State Medical Institute
[3]Assistant of the Department of Pediatric Surgery No. 1, Samarkand State Medical Institute
[4]Candidate of Medical Sciences, Assistant of the Department of Pediatric Surgery No. 1 of the Samarkand State Medical Institute
[5]Resident of the Master's Program of the Department of Pediatric Surgery No. 1, Samarkand State Medical Institute

Abstract Epiphyseal osteomyelitis occurs predominantly in infants, usually being one of the manifestations of sepsis. Purulent inflammation can be localized in any epiphysis. Sometimes there are multiple lesions. The prognosis, as well as the functional and anatomical results of treatment for epiphyseal osteomyelitis, depend primarily on the early recognition of the disease and, therefore, the timely initiation of treatment.

Keywords Dyspeptic symptoms, Vomiting, Loose stools, Epiphyseal osteomyelitis, Initiation of treatment, Manifestations of sepsis, Unfavorable premorbid background

1. Introduction

Acute pineal hematogenous osteomyelitis occurs in children at an early age and is often accompanied by disability due to the development of various severe orthopedic pathologies. Orthopedic complications (dislocations, deformities, shortening of limbs, contractures, ankylosis of large joints) are observed in 31-71% of cases and early diagnosis and timely treatment reduce the number of complications and promotes full recovery.

Along the course, epiphyseal osteomyelitis can be divided into toxic-septic and local focal forms. The toxic-septic form of epiphyseal osteomyelitis is characterized by an acute onset with a rapid rise in body temperature to 39-40℃. The general condition deteriorates sharply, the child refuses to breastfeed, anxiety appears, sometimes convulsions Facial features are sharpened, the skin takes on a gray tint. Some children have pronounced general weakness, decreased reaction to the environment. Dyspeptic symptoms often develop: vomiting, loose stools.

The local focal form begins less violently. Initially, malaise, loss of appetite appear, body temperature gradually rises. The general condition remains relatively satisfactory or is regarded as moderate. Intoxication is moderate. In both forms of epiphyseal osteomyelitis, the most constant symptom is pain in the affected limb, initially without a specific localization. The infant responds to pain with a change in behavior anxiety or a sharp cry, which are aggravated by any attempts to move. If before the illness the child calmed down after changing diapers, then in the event of osteomyelitis, any shifting, the slightest change in body position causes a loud, painful cry of the patient, who cannot calm down for a long time.

Phlegmon usually does not cause such severe pain when moving the limbs as osteomyelitis. Tissue infiltration, shaking on palpation, local temperature increase with phlegmon appear much earlier. The difficulty of differential diagnosis sometimes leads to erroneous conclusions about the nature of the inflammatory process. However, errors in these cases are of no practical importance, since children with these diseases need urgent surgical care. In some cases, only subsequent x-ray observation can clarify the diagnosis.

A bone fracture (especially a subperiosteal fracture of the femur) can be a reason for misdiagnosis due to the resulting pain and swelling at the site of injury, limited limb function and fever, as well as leukocytosis, which is usually detected in children on the first day after injury. The final diagnosis in such cases is established on the basis of X-ray examination.

When questioning the mother, it turns out that at the end of the 1st - the beginning of the 2nd day, the child became especially worried when touching a certain section of one of the limbs. He avoids all active movements and screams when trying to passively flex or extend the limb. On examination, the forced position of the affected limb is revealed, which is characteristic of each localization of the osteomyelitis

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process. Older children usually quite clearly indicate the place of greatest pain. When the upper epiphysis of the humerus is affected, the child's hand is brought to the body, motionless in all joints. Osteomyelitis of the proximal epiphysis of the radius or ulna is accompanied by flexion contracture in the elbow joint. Any attempt to straighten the arm or rotate the forearm causes the baby to cry. With the defeat of the distal epiphyses of the bones of the forearm, drooping of the hand, immobility of the fingers is noted. The upper epiphysis of the thigh is most often affected.

It has now been established that the key link in the pathogenesis of acute hematogenous osteomyelitis is the formation of a focus of acute inflammation in the bone, which is more often localized in the metaphyseal region and is characterized by a complex of standard vascular and tissue changes.

The formation of systematized ideas about the etiology and pathogenesis of OGO began with the vascular or embolic theory, proposed in 1884. E. Lexer. He believed that the anatomical age features of blood supply and bone structure are of great importance in the occurrence and development of osteomyelitis in children. Bones have a coarse fibrous, mesh structure; the interstitial substance consists of bundles intertwined in different directions, between which large bone cells are located. The spongy substance is loose, with wide vascular spaces. Abundant vascularization of bones is characteristic; numerous arteries have a wide diameter. The blood supply of long tubular bones in children is carried out by three vascular systems: diaphyseal, metaphyseal and epiphyseal. Near the epiphyseal line (the most common localization of the CSO focus), the vessels in the growing bone end blindly, not connecting with each other. The author believed that the presence of a dense network contributes to a significant slowing down of blood flow and mechanical retention of the bacterial embolus in one of the terminal vessels. A settled embolus causes a violation of the blood supply, the development of inflammation and necrosis of the bone tissue.

This point of view was continued in the works of a number of modern authors who adhere to the theory of bacterial embolism (Shchitinin V.E. et al., 2000). A bacteriological study of the bone marrow punctate made it possible to conclude that the microbial contamination of previously unaltered sections of the bone marrow cavity comes from the main focus in the metaphysis. It is from here that the infection is thrown into the lower and upper parts of the bone, which correspond to the boundaries of soft tissue edema.

However, the peculiarities of the blood supply to the metaepiphyseal zones of the tubular bones, which ensure the specific spread of the pathogen in acute hematogenous epiphyseal osteomyelitis, are leveled by 1-2 years of age, which distinguishes osteomyelitis in young children from that in older children.

The embolic theory of E. Lexer explains well the pathogenesis of secondary, "metastatic" osteomyelitis, which is often observed in septicopyemia of any nature. In this case, the source of bacteremia is easily identified. They are usually the primary inflammatory focus, complicated by sepsis. In children of the first three months of life, such foci can be an umbilical wound, skin diseases, intestines, etc.

With this localization of the process, the lower limb is slightly bent at the hip joint, rotated outward and abducted. There are no active movements in the hip joint, passive ones are sharply painful, especially rotational ones. The defeat of the epiphyses in the area of the knee joint is accompanied by flexion contracture at an obtuse or even right angle. For a more stable position of the limb and reduce pain, the child abducts the leg and rotates it outward.

Epiphyseal osteomyelitis in the ankle joint causes fixed plantar flexion of the foot, immobility of the fingers.In connection with the defeat of the epiphysis of the bone, which is located intraarticularly, the phenomena of arthritis develop rapidly. On examination, it is possible to reveal a noticeable swelling of the joint, smoothness of the contours. However, the process in the area of the hip and shoulder joints (which occurs most often) is usually detected later, since the joint is covered on all sides by a massive layer of muscles. It must be borne in mind that primary arthritis in newborns practically does not occur, therefore, in the presence of pronounced symptoms of purulent or serous joint damage, one should think about epiphyseal osteomyelitis. Palpation of the limb over the projection of the affected epiphysis causes severe pain, anxiety and resistance of the child.

In addition to the above early symptoms, epiphyseal osteomyelitis is characterized by local manifestations that become noticeable after 2-3 days from the onset of the disease. In the area of the affected epiphysis, a diffuse swelling appears, which is caused by swelling of the surrounding tissues. In the first days, palpation is determined by plasticity, and then a dense infiltrate around the epiphyseal end of the bone. The skin remains unchanged for some time. All these symptoms are detected relatively early if more superficially located epiphyses (elbow, wrist, knee and ankle joints) are affected. When a subperiosteal abscess breaks into soft tissues or into a joint, the local temperature rises noticeably, skin redness appears, and fluctuation is clearly expressed. If the breakthrough of pus occurred in the depth of the soft tissues (upper epiphysis of the shoulder and thigh), then there may be an expansion of the subcutaneous venous network and a bluish tint skin.

Blood tests performed in the first days of the disease serve as an auxiliary research method. Changes in the blood are similar to the data that are available in other manifestations of sepsis. Leukocytosis, according to our data, ranges from (12-30) x 109/l. Usually there is a shift in the leukocyte formula to the left. Turk cells appear, with a severe course of the disease, eosinophilia is expressed, ESR is increased in most cases. In the following days of illness, anemia increases. X-ray examination. The first radiological sign of epiphyseal osteomyelitis is some expansion of the joint space, which indicates the presence of an effusion. Therefore, it is recommended to produce an x-ray of the patient and healthy joints.

After 5-10 days, radiographs show minor destructive changes in the ossification nucleus, which are initially expressed by a rarefaction of the bone structure and a fuzzy pattern. In doubtful cases, changes are more clearly identified by a comparative examination of images of a healthy limb. In the region of the upper epiphysis of the femur or shoulder during the osteomyelitis process (in the later stages), large defects are often observed, up to complete resorption of the nucleus of the ossification of the head. In such cases, pathological dislocation occurs. The transition of inflammation to the bone metaphysis is characterized by periosteal layers in this area (not earlier than the 10-14th day of illness). Later, destruction develops here. In older children, pathological epiphysiolysis may occur. Along with destructive changes in osteomyelitis, reparative ones also occur. Light foci of rarefaction of the metaphysis (destruction) are surrounded by a dense sclerotic strip.

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