MODERN METHODS OF TREATMENT AND DIAGNOSIS OF ACUTE HEMATOGENOUS EPIPHYSEAL OSTEOMYELITIS IN INFANTS.

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Acute hematogenous epiphyseal osteomyelitis in infants is a rare but serious infectious disease that requires timely diagnosis and treatment to prevent complications such as bone deformities and growth disorders. This paper discusses modern diagnostic methods, including radiation diagnostics (MRI, CT), laboratory tests (CRP, procalcitonin) and molecular methods (PCR), as well as therapeutic approaches: antibiotic therapy and surgery. The analysis was carried out on the basis of the latest data from the scientific databases Google Scholar, Scopus and PubMed. The results of the study highlight the importance of early diagnosis and a combined treatment approach to improve disease outcomes.

Keywords. acute hematogenous epiphyseal osteomyelitis, infants, diagnosis, treatment, MRI, CT, laboratory tests, C-reactive protein, procalcitonin, polymerase chain reaction (PCR), antibiotic therapy, surgery, Google Scholar, Scopus, PubMed.

Introduction.

Acute hematogenous epiphyseal osteomyelitis in infants is a rare and severe infectious disease caused by the penetration of pathogenic microorganisms through the bloodstream into bone tissue. This disease affects the epiphyseal zones of the bones, which are critical for normal skeletal growth. Osteomyelitis in infants often has hidden symptoms, which makes it difficult to diagnose and treat in a timely manner. Due to the rapid progression of the inflammatory process, the lack of proper treatment can lead to irreversible consequences, including bone deformities, stunted growth, and the spread of infection to other tissues.

Modern diagnostic methods such as magnetic resonance imaging (MRI), computed tomography (CT), as well as molecular and laboratory tests make it possible to detect the disease in the early stages. However, clinical standards of patient management continue to evolve, which requires further research and analysis of new data.

In this regard, the study of modern approaches to the diagnosis and treatment of acute hematogenous epiphyseal osteomyelitis in infants is an important task to improve clinical practice and treatment outcomes.

Materials and methods.

For this study, a detailed analysis of the literature and scientific publications on the diagnosis and treatment of acute hematogenous epiphyseal osteomyelitis in infants was carried out. Sources published between 2013 and 2023 were used. The main databases for searching scientific publications were Google Scholar, Scopus and PubMed, which provided access to up-to-date information on this issue. Particular attention was paid to clinical trials, systematic reviews and meta-analyses aimed at assessing the effectiveness of diagnostic and therapeutic methods.

The search was carried out by the following keywords and their combinations: "acute hematogenous osteomyelitis", "epiphyseal osteomyelitis", "infants", "treatment", "diagnosis", "MRI", "CT", "PCR", "antibiotic therapy", "surgical intervention". All identified articles were selected based on inclusion and exclusion criteria. Main inclusion criteria: articles published in peer-reviewed journals, studies involving infants under 1 year of age, availability of data in publications on the diagnosis and treatment of osteomyelitis. Exclusion criteria included duplicate studies, publications without sufficient description of treatments or diagnosis, and articles relating to other types of osteomyelitis or other age groups.

The study used a systematic analysis of data, which included a comparison of different methods of diagnosis and treatment, as well as an analysis of their effectiveness and safety. The main diagnostic methods described in the literature were radiation diagnostics (X-ray, MRI, CT) and laboratory tests aimed at detecting the infectious agent and assessing the inflammatory process. Laboratory methods included bacteriological examination of blood, bone aspirate, as well as determination of C-reactive protein and procalcitonin levels as markers of inflammation.

Particular attention was paid to molecular diagnostic methods, such as polymerase chain reaction (PCR), which allows you to quickly and accurately determine the causative agent of infection. This technique was evaluated as the most promising, especially in cases where bacteriological examination does not give results.

Therapeutic approaches described in the literature varied depending on the severity of the disease and the age of the patient. The main methods of treatment were broad-spectrum antibiotic therapy and surgical intervention in case of complications. Antibiotic therapy began with empirical prescription of drugs, with subsequent adjustment based on data on the causative agent. The most commonly used are third-generation cephalosporins and aminoglycosides, as drugs with high efficacy against gram-positive and gram-negative bacteria. In cases of abscess or necrosis of bone tissue, methods of surgical drainage and sanitation of the affected areas of the bone were used.

The work also took into account data on the use of auxiliary therapies, such as physiotherapy, which included UHF, laser therapy and magnetotherapy to stimulate regenerative processes in bone tissue.

Statistical processing methods such as meta-analysis were used to analyze the data, which made it possible to summarize the data from various studies and give a comprehensive assessment of the effectiveness of the treatment and diagnostic methods used.

Results.

As a result of the analysis of scientific data on the diagnosis and treatment of acute hematogenous epiphyseal osteomyelitis in infants, key trends and directions in the development of modern treatment methods were identified. Diagnostic approaches used in clinical practice have demonstrated high effectiveness in early detection of the disease. Radiological diagnostics, including X-rays, magnetic resonance imaging (MRI) and computed tomography (CT), have shown that MRI is the most informative method, especially in the early stages of osteomyelitis. MRI allows not only to visualize inflammatory changes in bone tissue, but also to assess the degree of damage to soft tissues and bone marrow, which makes it a preferred method in diagnosis. Computed tomography has also been used for detailed visualization, especially in complex cases or when surgery needs to be planned.

X-rays, despite their low sensitivity in the early stages of the disease, continue to be an affordable and widespread diagnostic method. However, X-ray often does not allow you to detect pathology in a timely manner, especially in the first stages, when changes in bone tissue are still insignificant. At the same time, this method remains in demand for assessing the dynamics of the disease and its consequences.

Laboratory tests also played an important role in diagnosis. The most informative indicators were the levels of C-reactive protein (CRP) and procalcitonin, which correlated with the activity of the inflammatory process. Bacteriological examination of blood and bone aspirate made it possible in most cases to establish the causative agent of infection, which made it possible to adjust antibiotic therapy. It is important to note that PCR diagnostics have proven to be effective as a method for quickly and accurately identifying a pathogen. It is especially useful in cases where culture is inconclusive, which is common in infants with early stages of infection or when antibiotics are taken before testing

In the course of the analysis of treatment methods, it was revealed that antibiotic therapy remains a key method of treating osteomyelitis. Empirical broad-spectrum therapy was prescribed as the first line of treatment, and combinations of cephalosporins and aminoglycosides were used in most cases. These drugs have been shown to be highly effective against Gram-positive and Gram-negative bacteria, allowing for wide coverage of pathogens at the initial stage of treatment. After receiving the results of the bacteriological study or PCR, the treatment was adjusted for more targeted antibiotic therapy.

In some cases, when the formation of abscesses or necrotic changes in bone tissue was observed, surgical intervention methods were used. The most common operations were performed to drain and sanitize purulent foci, which made it possible to reduce the level of intoxication and prevent the further spread of infection. Surgical intervention was especially relevant in cases of late diagnosis, when antibiotic therapy did not give the expected effect.

In addition, complementary therapies such as physiotherapy have been shown to have a positive effect on the recovery process after surgery and in the later stages of the disease. The use of physiotherapeutic methods, such as magnetotherapy and UHF, helped to improve blood circulation in the affected areas and stimulated the processes of bone tissue regeneration. This, in turn, reduced recovery time and reduced the risk of complications.

A systematic review of clinical evidence has shown that timely diagnosis, combined with adequate treatment, can significantly improve disease outcomes in infants. The early use of MRI and PCR testing, along with laboratory tests, contributes to a more accurate and faster diagnosis, which reduces the risk of developing severe complications such as sepsis, bone deformity and growth retardation.

In general, the analysis of literature and clinical data demonstrates that an integrated approach to treatment, including early diagnosis using modern technologies, as well as the competent use of antibiotics and surgical treatment, significantly reduces the risk of adverse outcomes and improves the quality of life of patients.

Conclusions.

Based on the study, several key conclusions can be drawn regarding modern methods of diagnosis and treatment of acute hematogenous epiphyseal osteomyelitis in infants. The most important factor determining the success of treatment is timely and accurate diagnosis. The use of modern imaging techniques, such as magnetic resonance imaging (MRI), makes it possible to detect osteomyelitis in the early stages, even before the appearance of significant bone damage, which significantly improves the prognosis for patients. MRI is highly accurate and informative, which makes it the preferred method, especially in cases with suspected epiphyseal bone lesions. Computed tomography (CT) scans are also used to evaluate lesions in detail, especially when surgical planning is necessary, while X-rays remain less sensitive but can be useful in the later stages.

Laboratory tests, including measurement of C-reactive protein and procalcitonin levels, play a key role in monitoring the activity of the inflammatory process. These biomarkers make it possible to assess the degree of inflammation and the effectiveness of treatment, while bacteriological studies of blood and bone aspirate make it possible to identify the causative agent of the infection. Polymerase chain reaction (PCR) is of

particular importance in diagnostics, which provides quick and accurate detection of bacterial pathogens, especially in cases where bacteriological culture does not give a result.

As for treatment methods, antibiotic therapy remains the main and most effective way to fight infection. Empirical broad-spectrum therapy based on the use of cephalosporins and aminoglycosides demonstrates high efficacy in the early stages of treatment. As the causative agent of the infection is clarified, therapy can be adjusted to ensure the most targeted effect on the pathogen. An important aspect is the need for early antibiotic therapy, which significantly reduces the risk of complications.

In cases where the disease progresses and complications occur, such as the formation of abscesses or necrotic changes in the bone tissue, surgical intervention is required. Drainage of purulent foci and sanitation of affected areas can reduce the burden on the body and prevent further spread of infection. Surgical treatment is especially relevant in cases where antibiotic therapy does not give the expected effect, which is often observed with late diagnosis.

Complementary therapies such as physiotherapy play an important role in the rehabilitation process. The use of physiotherapeutic procedures helps to accelerate regenerative processes in the affected bone, improve blood supply and reduce the risk of complications. The use of methods such as magnetotherapy and ultra-high frequency therapy (UHF) has a positive effect on the speed of recovery of patients.

Thus, a comprehensive approach to the diagnosis and treatment of acute hematogenous epiphyseal osteomyelitis in infants, including modern imaging methods, laboratory tests, antibiotic therapy and surgical methods, can significantly improve treatment outcomes and minimize the risk of severe complications. Timely detection of the disease and early initiation of adequate treatment are the main factors that ensure successful recovery. An important area of future research is the further optimization of diagnostics and the development of new approaches to treatment, taking into account the characteristics of infancy and the pathogenetic mechanisms of the development of osteomyelitis.

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