

Diagnosis of Acute Rheumatic Fever and Rheumatic Carditis

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Abstract: Acute rheumatic fever (ARF) and its sequelae rheumatic heart disease (RHD) remain significant causes of morbidity and mortality. The purpose of this narrative review is to present secondary interventions to improve early and accurate diagnosis of ARF and RHD. Acute rheumatic fever is an autoimmune response to group A Streptococcal infection.

The false path of RHD development allows for a variety of disease control strategies. It is important to diagnose acute rheumatic fever and rheumatic heart disease as early as possible so that secondary prevention can be initiated and the progression of the disease can be slowed.

When a diagnosis of acute rheumatic fever (ARF) is made, intramuscular injections of benzathine benzylpenicillin G are recommended at least once every 28 days to prevent relapses of ARF and progression of rheumatic heart disease (RHD). In most cases, patients require secondary prevention for 10 years or more.

Keywords: diagnostics; echocardiography; rheumatic fever; rheumatic heart disease; secondary prevention.

Early diagnosis of acute rheumatic fever and rheumatic carditis is an extremely important aspect of providing effective treatment and preventing possible complications. These diseases are part of the group of rheumatic diseases that can seriously affect the heart and leave irreversible consequences for the patient.

Acute rheumatic fever (ARF) is a reactive disease that develops following an inappropriate immune response to group A streptococcal infection. Characterized by inflammation in various organs and systems, including the joints, heart, central nervous system, and supporting tissue of the heart.

However, the main threat in ARF is rheumatic heart disease - inflammation of the heart valves, which can lead to serious functional disorders of the heart and require emergency surgical intervention. Therefore, early detection and diagnosis of rheumatic carditis are key points in the management of patients with ARF.

To achieve optimal results, a comprehensive approach to the diagnosis of acute rheumatic fever and rheumatic carditis is recommended. An important element is the careful collection of information about the patient's medical history, including previous infectious diseases, features of symptoms, and the presence of family cases of rheumatic diseases.

Clinical manifestations of ARF and rheumatic carditis are very diverse and may vary depending on the individual characteristics of the patient's body. Signs to look out for include fever, joint pain, skin rashes, shortness of breath, fatigue, abnormal heart rhythms, and difficulty breathing. Particular attention should be paid to changes in heart sounds and the presence of murmurs.

An important step in the diagnosis of rheumatic carditis is the use of laboratory tests to check for the presence of elevated C-reactive protein (CRP), elevated class M antibodies to group A streptococci, and antinuclear factor (ANF) antibodies.

An electrocardiogram (ECG) examination can additionally reveal the presence of conduction disturbances and functional changes in the heart. To determine the degree of damage to the heart valves, echocardiography is recommended, which allows you to visually assess the condition of the heart valves and the function of the heart muscle. At the same time, it is important to emphasize that early diagnosis of acute rheumatic fever and rheumatic carditis is impossible without active interaction

between medical specialists of various profiles, including a therapist, rheumatologist, cardiologist and laboratory assistant. Only joint efforts will allow us to achieve a high level of diagnostic accuracy and ensure timely treatment, favorable prognosis and improvement of the quality of life of patients with acute rheumatic fever and rheumatic carditis.

Diagnosis of rheumatic carditis on an echocardiogram (Echo CG) is an important tool for identifying this disease. Rheumatic carditis is an inflammation of the heart valves that occurs as a complication of an untreated or inadequately treated group of infections caused by streptococci. This inflammation can lead to serious diseases such as intracardiac hemorrhage, heart defects and heart failure.

Echocardiography is an immediate, non-complex and non-invasive method for diagnosing rheumatic carditis. It allows you to assess the functional state of the heart, identify changes associated with this disease, as well as determine its extent and distribution. A key feature of Echo CG in the diagnosis of rheumatic carditis is the ability to visualize heart valves, assess their condition and detect physiological or pathological changes.

When performing EchoCG to diagnose rheumatic carditis, a number of factors must be taken into account. Using this method, you can determine the presence of inflammation of the valves, changes in their structure, and also assess the degree of damage. The main echo signs of rheumatic carditis are: changes in the size and thickness of the valves, their deformation, limited mobility, the presence of scale and fibrin, as well as the presence of regurgitation.

Determining the extent of involvement and spread of rheumatic carditis based on an echocardiogram requires reference to standard criteria for qualitative and quantitative assessment. A professional diagnostician must be able to determine the image of all valves, establish the nature of their damage, assess the dynamics of changes, and also make a differential diagnosis with other heart diseases.

Thus, diagnosing rheumatic carditis on an echocardiogram is an important step in determining this disease. This is a non-invasive and informative method that allows you to see changes in the structure and function of the heart valves, as well as assess the extent of damage and spread of the disease. It opens up the possibility of early detection of rheumatic carditis, which makes it possible to begin its treatment and prevent the development of serious complications.

Scientific studies conducted in the mid-twentieth century showed that 40-60% of patients with ARF develop RHD, and the rate of reversal of mitral regurgitation increases from 20 to 70% after penicillin administration. Prompt prevention remains one of the main challenges in the effective control of ARF and RHD: the likelihood of recurrent cases of ARF is four times higher in patients receiving less than 80% of the recommended dose of treatment. Therefore, the World Health Organization and the World Heart Federation (an association of international heart foundations and medical societies) recommend the use of a patient registry for monitoring secondary prevention and follow-up.

In 2015, the American Heart Association revised the 1992 Jones diagnostic criteria. The criteria are in response to changes in the global epidemiology of ARF and increasing knowledge of the variability in the presentation of ARF. The purpose of the update was to increase the sensitivity of the criteria in areas where ARF is endemic and to maintain high specificity in low-risk areas (incidence of ARF <2 per 100,000 school-age children per year or prevalence of ARF among all ages <1 per 1000 population per year). These changes now offer two separate diagnostic pathways that prioritize specificity among low-risk individuals and sensitivity among moderate/high-risk individuals. Echocardiography is recommended in all patients with suspected or confirmed ARF, and in all populations the main criterion may be subclinical carditis. In addition, the updated criteria now include the diagnosis of recurrent ARF. Evaluations of the revised Jones criteria have shown that these changes improve the diagnosis of ARF in moderate- and high-risk populations and allow for accurate assessment of the risks associated with the occurrence of latent RHD. A Turkish study of 50 children found that the updated Jones criteria prevented ARF when ARF was diagnosed in 18% of children. Additionally, other studies have shown that these changes will lead to better clinical outcomes due to earlier disease detection.

Over the past 20 years, technological advances have seen an increase in the use of small, portable ultrasound machines that allow echocardiography to be performed at the point of care. This has led to increased interest in echocardiographic screening for RHD.^{42,45,46} With the growing recognition of latent RHD, in 2012 the WHF developed criteria for the echocardiographic diagnosis of RHD based on the presence of pathological grade left-sided valvular regurgitation and typical morphological features of the valve leaflets. These criteria make it possible to distinguish between ages, without a borderline category for persons over 20 years of age.

The role of echocardiography examination methods in the diagnosis of valvular lesions was highly appreciated by domestic specialists. In 2003, signs of mitral and aortic regurgitation detected by echocardiography were included in the minor diagnostic criteria for ARF, modified by the Association of Rheumatologists of Russia (ARR). Somewhat later, in 2004, WHO recommended echocardiography examination in regions with a high prevalence of CRHD. The main echocardiographic signs of valvulitis of the mitral and aortic valves were described in detail. Thus, echocardiographic criteria for rheumatic valvulitis of the mitral valve include marginal “loose” thickening of the anterior mitral leaflet (ML) with an anterior MV thickness index of at least 2 and the length of the thickening no more than 15 mm; mitral regurgitation; hypokinesia of discordant posterior MS; transient dome-shaped bending of the anterior MS during its discordant movement. Valvulitis of the aortic valve was characterized by marginal thickening of the aortic valve and the presence of aortic regurgitation. As can be seen from the presented domestic criteria, valvulitis MK differs from the characteristics proposed by the AHA. Signs such as chordal rupture, “dangling leaflet” with the development of severe MR, are much more often observed in infective endocarditis. When studying the course of rheumatic valvulitis in children in 1980-2000, these symptoms did not occur.

The problem of valvular lesions of a rheumatic nature, detected by echocardiography in children and adolescents, without clinical and auscultatory manifestations of carditis, has attracted Russian clinicians since the introduction of ultrasound methods for diagnosing heart diseases.

Back in 1995 E.I. Polubentseva published the results of studies of a group of patients, including patients from the children's clinic of the Institute of Rheumatology of the Russian Academy of Medical Sciences, who had high criteria for LC (arthritis, chorea) in the presence of elevated and increasing titers of ASLO, in whom the DEHOCG symptom complex of aphonic carditis was described. Valvulitis had characteristic criteria: the presence of marginal thickening of the anterior MS with a thickness index of at least 2 in combination with minimal MR. The hemodynamic parameters of aphonic MR were characterized by a low transmitral flow velocity (from 0.6 to 2.2 m/s), as well as a small area of turbulent flow (up to 10% of the left atrium area), which corresponded to grade I MR. As you can see, the echocardiographic characteristics of aphonic carditis, described by Russian specialists, generally coincide with the parameters of valve lesions in subclinical carditis, proposed by the AHA in 2015. With such hemodynamic characteristics, regurgitation may not be verified by auscultation even by an experienced specialist. This phenomenon was called by the author rheumatic carditis without organic noise.

It must be emphasized that aphonic carditis was first described in the classic course of ARF, meeting the Jones criteria, in which arthritis or minor chorea were major criteria. However, as practical experience shows, with clinically significant damage to one valve, it is possible to detect aphonic regurgitation on the second. In addition, aphonic carditis can also be a manifestation of classic rheumatic carditis.

In the WHF publication on echocardiographic criteria for rheumatic heart disease, dated 2012, these echocardiographic characteristics are defined as borderline+. It should be considered extremely important that, based on an analysis of numerous clinical studies related to the study of the evolution of valvular lesions, the authors conclude that this concept can be applied only to children and adolescents (under 20 years of age). It was in this group of patients that the dynamics of DEHOCG changes were noted during the observation process. It is recommended to include in this group of patients those who exhibit at least two morphological echocardiographic signs of rheumatic valve

disease without the presence of pathological valvular regurgitation. It would not be superfluous to recall that the diagnosis of probable ARF implies a high level of specialist in DECHO and the use of modern ultrasound equipment. Management tactics for such patients: prescribing secondary prophylaxis with benzathine-penicillin for a period of at least 12 months, followed by dynamic echocardiography examination.

In conclusion, it should be noted that the Kisel-Jones diagnostic criteria remain a unique diagnostic tool that has confirmed its validity in recognizing ARF at various stages of its study.

Modification of the criteria through the use of the results of modern highly informative methods of ultrasound examination of the heart makes it possible to verify the diagnosis of ARF at the initial stages of the formation of valvular lesions and apply early therapeutic tactics.

The use of echocardiographic aortic valve regurgitation became the basis for identifying a new subtype of organic valve disease - subclinical carditis. Particular attention should be paid to transient echocardiographic signs of damage to the valvular apparatus of the heart, which may indicate the presence of an organic valve defect. It is essential to develop a specialized treatment program for this group of patients. To establish a diagnosis, a combination of basic clinical, laboratory and instrumental signs of the disease is necessary, which must correspond to the pathogenetic mechanisms of its development.

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