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ACUTE ACQUIRED CARDITIS IN CHILDREN ASSOCIATED WITH VIRAL INFECTIONS: CLINICAL AND DIAGNOSTIC ASPECTS

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Annotation. The diagnosis of viral lesions of the heart muscle, based on a convincing evidence base, remains one of the key problems of this pathology. Acute carditis can be a manifestation of any infectious disease. However, viruses are the most common cause (70-95%), especially in children in the first years of life, and in a third of cases, carditis develop against the background of superinfection.

Keywords. Acquired carditis, acute viral infection, heart failure, electrocardiography, community-acquired pneumonia, children who are often ill.

Relevance. Acute acquired carditis is one of the clinically significant non-rheumatic cardiovascular conditions in children and may develop in association with infectious diseases, with viral infections representing a particularly important group. The widespread occurrence of viral infections in the pediatric population, the ability of certain viruses to affect the vascular endothelium and cardiomyocytes, and the potential for prolonged persistence of infectious agents in the body underscore the importance of studying the mechanisms underlying virus-associated myocardial injury [3,8].

Despite the substantial body of research, the true prevalence of viral carditis in children remains insufficiently established. This is primarily attributable to difficulties in etiological verification and the lack of a standardized diagnostic approach [1,5].

The clinical manifestations of early myocardial involvement are often nonspecific, while electrocardiographic and echocardiographic abnormalities may be subtle or masked by the symptoms of the underlying infectious disease. Therefore, early recognition of inflammatory myocardial involvement and assessment of its possible association with viral infection remain important challenges in contemporary pediatric cardiology [2,3,4].

Of particular importance is the fact that carditis may develop not only during the acute phase of an infectious process but also at different stages of the disease. In the early stages, clinical manifestations such as weakness, tachycardia, dyspnea, reduced exercise tolerance, and electrocardiographic abnormalities may be mistakenly attributed solely to the systemic manifestations of infection and intoxication. This may contribute to delayed recognition of

myocardial involvement and the development of more pronounced functional and structural myocardial abnormalities [1,6,7].

In recent years, increasing attention has been given to myocardial involvement in children with intrauterine or postnatal infections caused by viruses of the Herpesviridae family, cytomegalovirus, and other respiratory viruses, including SARS-CoV-2. Intrauterine infection may be associated with cardiovascular involvement in the fetus, while viral infections occurring during early childhood are considered potential factors associated with the subsequent development of inflammatory myocardial changes [3,5,8].

Thus, investigating the relationship between viral infection and the development of acute acquired carditis in children is of considerable clinical importance. Identification of historical, clinical, and instrumental findings suggestive of possible virus-associated myocardial involvement may increase clinical awareness, facilitate early diagnosis, and support timely decisions regarding patient monitoring and management.

Objective. To investigate the clinical and instrumental characteristics of acute acquired carditis in children developing during or following a viral infection.

Materials and Methods. The study was conducted at the Cardiorheumatology Department of the Andijan Regional Children's Multidisciplinary Medical Center. The study included 40 children diagnosed with acute acquired carditis.

At the initial stage of the study, interviews were conducted with the parents and children, followed by a targeted clinical examination and analysis of laboratory and instrumental findings. During the interview with the mothers, particular attention was paid to the course of the antenatal and perinatal periods, including viral infections during pregnancy and the presence of pregnancy-related complications. Instrumental assessment of each child included a standard 12-lead electrocardiogram (ECG), echocardiography (EchoCG) with Doppler assessment, and plain chest radiography with calculation of the cardiothoracic ratio.

Results and Discussion. The age range of the examined children was relatively broad, from 6 months to 15 years. The largest proportion of patients were children under 3 years of age, including 40% aged 6–12 months and 35% aged 1–3 years. Boys were more frequently affected than girls (57.5% versus 42.5%)/

To assess the potential contribution of perinatal factors, we analyzed the perinatal history of all children with acute acquired carditis (n = 40), which developed as a complication following an acute viral infection.

Analysis of the maternal history revealed that all mothers had experienced an unfavorable course of pregnancy, associated not only with pregnancy-related complications such as toxicosis and threatened miscarriage, but also with a high frequency of acute viral infections during pregnancy.

Risk factors during pregnancy

	abc	**%**
Adverse factors during pregnancy:		
- toxicosis	**40**	**100%**
- threatened miscarriage	**16**	**40%**
- fetoplacental insufficiency	**6**	**15%**
- preeclampsia	**3**	**7,5%**
Illnesses during pregnancy:		

Acute respiratory viral infection (ARVI) — once	**18**	**45%**
— wice	**22**	**55%**
of which SARS-CoV-2	**5**	**12,5%**
TORCH infection	**8**	**20%**
Anemia – moderate	**28**	**70%**
– severe	**12**	**30%**

A very high proportion of women were found to have experienced acute viral infections during pregnancy, including coronavirus infection. This risk factor affected not only the timing of delivery but also contributed to a complicated neonatal period in the examined children. We found that pregnancy ended in preterm delivery in 35% of women. Birth asphyxia was recorded in 30% of the children, and in two-thirds of these cases it was associated with umbilical cord entanglement around the neck.

The presence of underlying conditions during early childhood was also considered as a potential risk factor that could adversely affect health status during subsequent periods of childhood. These conditions included anemia (100%), rickets (100%), protein-energy malnutrition (5%), and others.

According to published data, recurrent respiratory viral infections, particularly those complicated by pneumonia, represent an important risk factor for the development of acute acquired carditis. This finding was also supported by our study, as all examined children belonged to the group of frequently ill children due to recurrent acute viral infections: twice a year in 65% of cases and three or more times a year in 35%. Recurrent acute pneumonia, occurring two or more times per year, was reported in 47.5% of the children.

At hospital admission, the clinical condition of two-thirds of the children was assessed as severe. In 11 children (27.5%), acute carditis was diagnosed upon admission to the hospital, where the initial diagnosis was community-acquired pneumonia. In the remaining 72.5% of children, signs of cardiac involvement were detected 2–3 weeks after an acute respiratory viral infection.

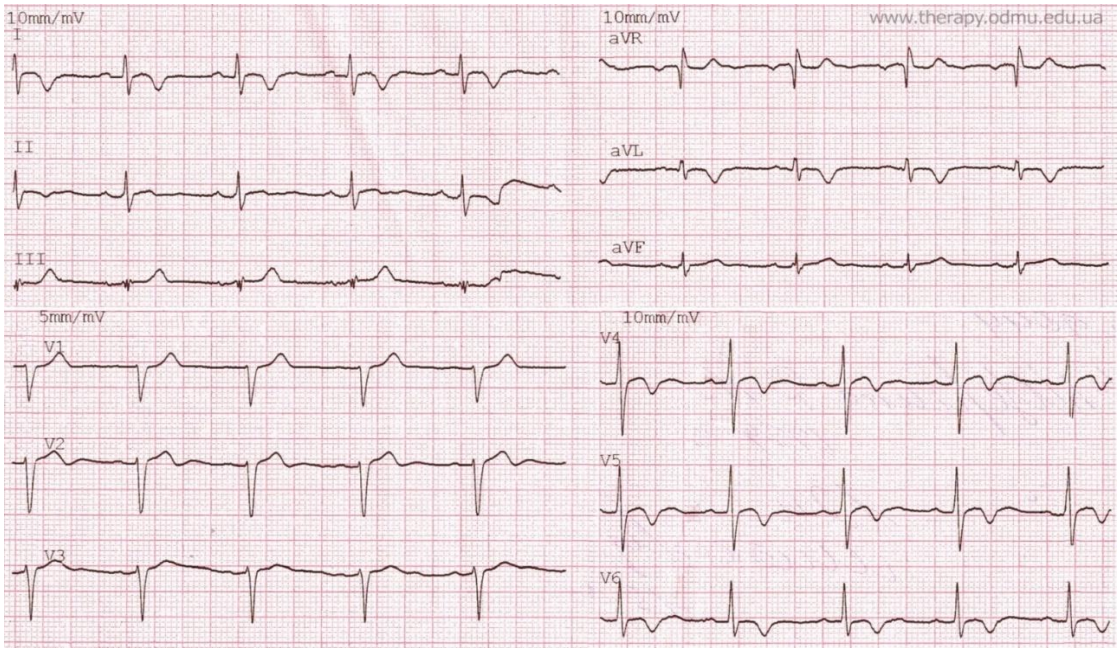
The presenting complaints varied considerably. The most frequent symptoms were dyspnea (100%), progressive weakness (100%), grunting respiration (80%), cough (60%), elevated body temperature (45%), and sleep disturbances (20%). Cardialgia was less common (5%) and occurred predominantly in older children. In younger children, oliguria accompanied by edema was observed in 20% of cases. Hepatomegaly, as a manifestation of heart failure, was detected in 70% of the children.

Based on the subjective and objective clinical findings, more than two-thirds of the children had carditis accompanied by heart failure classified as NYHA functional class II–III equivalent/severe stage II B, which was observed in 70% of cases.

In addition to clinical manifestations, electrocardiographic signs of acute carditis were identified. From a prognostic perspective, findings suggestive of subendocardial ischemia were considered unfavorable. These were identified based on ST-segment and T-wave abnormalities. In 6 children (15%), ST-segment depression below the isoelectric line accompanied by a flattened T wave was observed in the left precordial leads (V5–V6), while 3 children demonstrated a negative, peaked T wave in the same leads.

ECG of patient R., 5 years old, medical record No. 3078/395.

The ECG demonstrated sinus tachycardia (heart rate 150 beats/min) and signs of subendocardial ischemia.



Echocardiography provided information on the dimensions of the cardiac chambers, including increased left ventricular end-systolic and end-diastolic dimensions, as well as a reduced ejection fraction. The left ventricular end-systolic dimension ranged from 15 to 44 mm, while the end-diastolic dimension ranged from 36 to 58 mm. The ejection fraction was below age-adjusted reference values in all children and ranged from 28% to 50%.

The echocardiographic findings supporting the diagnosis of acute carditis included increased left ventricular end-systolic and end-diastolic dimensions and reduced ejection fraction (28–50%).

The degree of cardiomegaly was assessed using the cardiothoracic ratio (CTR) on plain chest radiography.

Chest radiography revealed enlargement of the cardiac silhouette, predominantly due to left ventricular enlargement, as well as signs of pulmonary congestion manifested by increased pulmonary vascular markings. The minimum cardiothoracic ratio was 64%, while the maximum value reached 70%.

Chest radiograph of patient I., 2 years old, medical record No. 19031/1053.



On the chest radiograph, cardiomegaly was observed, with a cardiothoracic ratio (CTR) of 68%, accompanied by signs of pulmonary congestion.

Conclusions. Acute acquired carditis in children may develop during or shortly after a viral infection, highlighting the importance of the infectious history when assessing the risk of myocardial involvement.

A comprehensive assessment of the medical history, clinical status, electrocardiographic and echocardiographic findings is important for the timely detection of inflammatory myocardial involvement in children following a viral infection.

Maintaining a high level of clinical suspicion for cardiac involvement during viral infections, together with dynamic follow-up and early instrumental assessment in children with suspected myocardial involvement, may facilitate earlier diagnosis of acute acquired carditis and help prevent the progression of cardiovascular dysfunction.

References

1. Balykova L.A., Krasnopolskaya A.V., Vlasova E.A. Myocarditis in Children: Clinical Presentation, Diagnosis, and Treatment. Pediatric Pharmacology, 2020, Vol. 17, No. 2, pp. 137–147.
2. Efimenko O.V., Khaydarova L.R. Assessment of the Impact of Potential Risk Factors on the Course of Non-Rheumatic Carditis. Economics and Society, No. 2 (105), 2023, pp. 1–9.
3. Efimenko O.V., Khaydarova L.R. The Role of Viral Infection in the Development of Non-Rheumatic Carditis in Children. Economics and Society, 2024, No. 2 (117), pp. 992–998.
4. Potekhina M.N., Naumenko E.I., et al. Non-Rheumatic Myocarditis in Children: A Clinical Case Report. Modern Problems of Science and Education, 2022, No. 4, pp. 2–8.
5. Taradin G.G., Ignatenko G.A., et al. Sudden Cardiac Death in Myocarditis. Almanac of Clinical Medicine, 2023, Vol. 51, No. 2, pp. 99–109.
6. Shavazi N.M., Lim M.V. Echocardiographic Parameters in Children with Community-Acquired Pneumonia and Myocarditis. Journal of Hepato-Gastroenterological Research, 2022, No. 1, pp. 70–73.
7. Chang Y.-J., Hsiao H.-J., Hsia S.-H. et al. Analysis of clinical parameters and echocardiography as predictors of fatal pediatric myocarditis. PLoS ONE. 2019. Vol. 14 (3).
8. Zhang M., Wang H., Tang J., He Y., Xiong T., Li W., Qu Y., Mu D. Clinical characteristics of severe neonatal enterovirus infection: a systematic review. BMC Pediatr. 2021. Vol. 21 (1). P. 127.