EXPERIENCE WITH LEVOCARNITINE IN THE COMPLEX TREATMENT OF COMMUNITY-ACQUIRED PNEUMONIA IN CHILDREN WITH MYOCARDITIS

Kardzhavova Gulnoza Abilkasimovna
Assistant of the department 1-pediatrics and neonatology,
Samarkand State Medical University
Samarkand Uzbekistan

Abstract: Pneumonia in children is one of the urgent problems of pediatrics, which is determined by the continuing high incidence and severe prognosis, especially in young children. The aim of the study was to evaluate the effectiveness and use of levocarnitine in the treatment and prevention of myocarditis in children. We examined 150 children aged 1 to 7 years with pneumonia, which we divided into 4 groups. The results proved that against the background of community-acquired pneumonia in children, all the symptoms of acute heart failure are masked, the cause of which in most cases is acute coronary insufficiency, a change in the heart muscle in this pathology in children increases the risk of severe unwanted complications from the heart, which should be included in the future in complex therapy, the drug levocarnitine.

Key words: acute myocarditis, community-acquired pneumonia, levocarnitine, children.

Relevance

Over the past few decades, severe pneumonia has remained one of the urgent problems of modern medicine due to the steady upward trend in the number of patients and consistently high mortality, despite the use of new principles and methods of treatment [5,7,8]. One of the main causes of acute myocarditis today is acute respiratory viral infections (ARVI), which remain the most common and global diseases in children [10]. Cardiovascular insufficiency is typical of pneumonia, especially in young children. It develops rapidly, already in the early stages of the disease. In an uncomplicated course of the disease, clinically hidden heart failure occurs, which is diagnosed using instrumental studies such as ECG, echocardiography [9, 11]. With community-acquired pneumonia in children, dysfunction of the cardiovascular system can be clinically manifested as coronary insufficiency, and more often as cardiovascular insufficiency [11]. Each influenza epidemic accompanied by a complication of pneumonia in children is associated with an increase in the number of cases of acute myocarditis, which determines the relevance of studying this problem.

Hypoxia, pathogenetically occurring in pneumonia, and even more so in pneumonia with myocarditis in children, is a powerful stress factor contributing to the development of secondary mitochondrial dysfunction, disruption of cellular energy metabolism, and may be associated with L-carnitine deficiency. When cellular metabolism is disturbed, the most energy-dependent organs and systems suffer, including the respiratory and cardiovascular systems [4].

Currently, clinical experience has been accumulated on the use of levocarnitine in pediatrics, recommendations have been developed for its dosage in various pathologies and conditions in children [1].

Taking into account the nature of the identified disorders in children with CAPM, we chose Elkar®, the active substance levocarnitine, as the optimal drug with a metabolic effect. The drug was used at a dose of 100 mg/day in 2 oral doses, during the entire period of treatment of patients.

Target. To evaluate the effectiveness of treatment with levocarnitine for community-acquired pneumonia with myocarditis in children.

Materials and research methods. The results of complex treatment of 150 sick children with community-acquired pneumonia on the basis of I and II children's departments and intensive care units of the Samarkand branch of the Republican Scientific Center for Emergency Medical Care were analyzed. The results of anamnestic, clinical, generally accepted laboratory, microbiological, virological, instrumental and special methods of examination in 150 children with community-acquired pneumonia aged from 1 month to 7 years, including 120 patients with concomitant myocarditis, were studied.

When analyzing the effectiveness of various therapeutic approaches at the 2nd stage of the study, 120 children with community-acquired pneumonia with myocarditis (patients from groups B and C from the 1st stage of the study) were divided into 4 groups:

In group I, 30 patients with community-acquired pneumonia with myocarditis received standard therapy.

In group II, 30 patients with community-acquired pneumonia with myocarditis received pentoxifylline in the complex of standard therapy.

In group III - 30 patients with community-acquired pneumonia with myocarditis who received levocarnitine in the complex of standard therapy.

Group IV included 30 patients with community-acquired pneumonia with myocarditis who received pentoxifylline and levocarnitine as part of standard therapy.

All groups were comparable in age, gender, etiology of the disease, severity of the course, complications, comorbidity and ongoing basic therapy. The exclusion criteria from the study were patients with chronic (hereditary) diseases of the bronchopulmonary system and congenital heart defects naturally accompanied by cardiovascular changes.

The formation of groups and subgroups in order to assess the diagnosis and effectiveness of treatment was carried out in compliance with the principles of randomization and a simple blind method.

The control group consisted of 30 practically healthy children.

Verification of the diagnosis of pneumonia was carried out according to the classification of the main clinical forms of bronchopulmonary diseases in children, approved at the meeting of the XVIII National Congress on Respiratory Diseases [3]. We used the classification of myocarditis in children of the working group of the Association of Pediatric Cardiologists of Russia [6].

Upon admission, patients were prescribed identical basic therapy for pneumonia and myocarditis in accordance with currently used protocols and clinical guidelines [2,6].

Fig. 1.Distribution of patients by sex.

Analysis of patients by sex differences (Fig. 1) showed that boys (58.7%) were predominantly ill in comparison with girls (41.3%).

Among the examined patients (Fig. 2), the majority were children aged 3-4 years - 81 (54.0%), from 1 to 2 years - 47 (31.2%) and less often in children aged 5 years - 22 (14.7%), which is comparable with the literature data on the incidence of pneumonia.

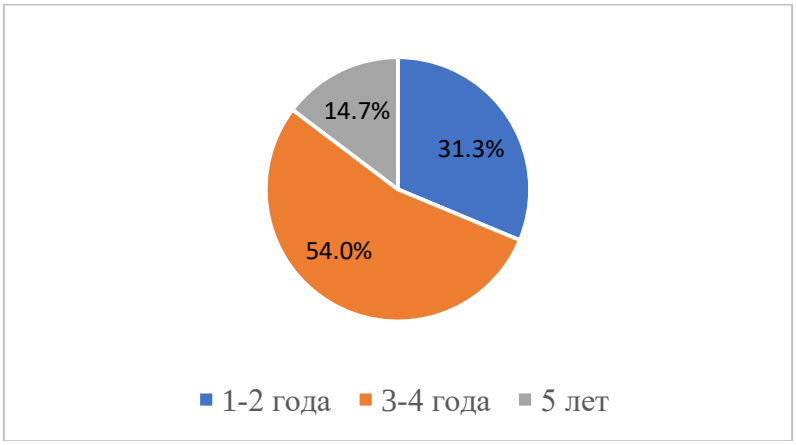

Fig.2. Age structure of patients.

The discharge of sick children from the hospital was carried out taking into account the specifics of the work of the EMC service according to the standards of diagnosis and treatment, in which the recommended terms of inpatient treatment are 11 days for community-acquired pneumonia. In the future, if necessary, monitoring and treatment of discharged patients.

Research results. The dynamics of clinical indicators (Fig. 3) showed an improvement in symptoms in patients treated with levocarnitine in comparison with traditional treatment from 0.6 to 1.9 days. Improvement in the general condition in patients of group III occurred on day 6.4±0.3, cyanosis of the nasolabial triangle disappeared on day 6.6±0.3, temperature normalization on day 6.4±0.4, normalization of auscultatory data in the lungs on 8.4±0.5 days, disappearance of respiratory failure on 7.2±0.3 days, normalization of the heart boundaries was

detected on 9.0±0.6 days, disappearance of systolic murmur on 10.7±0.5 days, but statistically insignificant in comparison with group I (P>0.1, P>0.2, P>0.5).

Only the disappearance of acrocyanosis at 7.9±0.5 days and tachycardia at 8.0±0.4 days showed a significant effectiveness of the effect of levocarnitine on the course of the disease (P<0.05, P<0.01). However, according to the duration of inpatient treatment (11.6 ± 0.6 days), there was no significant clinical benefit of levocarnitine in the treatment of CAPM in children, in comparison with traditional therapy (P> 0.1).

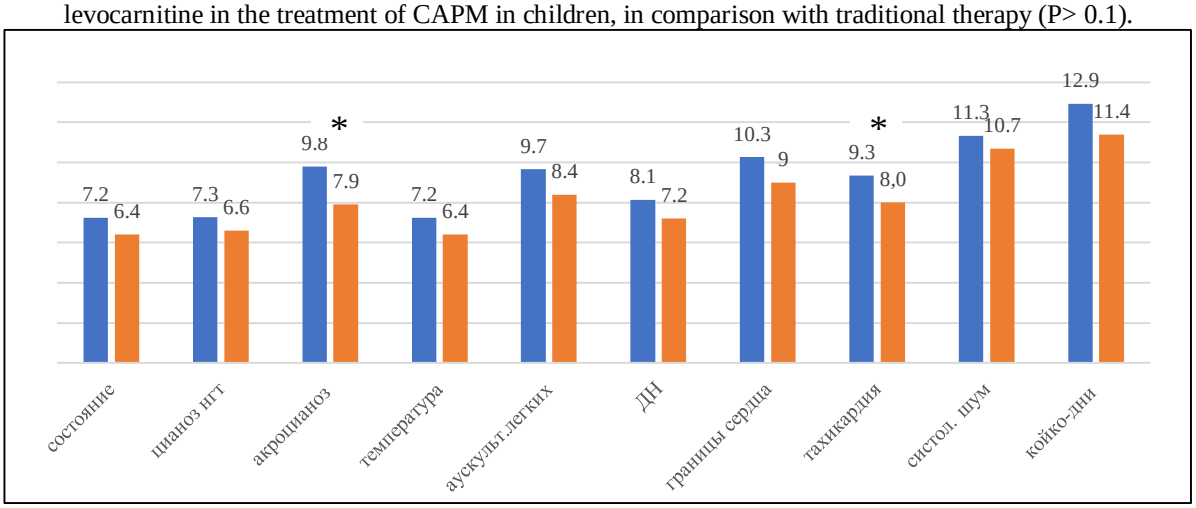

Fig.3. Dynamics of the elimination of the main signs of community-acquired pneumonia with myocarditis in patients of groups I and III.

Note: – Group I, - Group III, * - P<0.05, P<0.01 - significance of differences between groups.

Table 1

State of ECHOCG at admission in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P_1	P_2	P_3
ESS, cm	2,44±0,11	3,91±0,23	3,78±0,20	<0,001	<0,001	>0,5
ESV, ml	22,39±1,01	65,57±2,95	59,83±3,15	<0,001	<0,001	>0,2
EDS, cm	3,72±0,17	4,79±0,26	4,65±0,23	<0,001	<0,001	>0,5
EDV, ml	58,48±2,13	114,05±5,28	116,32±4,11	<0,001	<0,001	>0,5
BV, ml	36,19±1,58	54,52±2,26	50,46±2,24	<0,01	<0,001	>0,2
EF, %	61,7±2,2	48,8±4,4	44,9±3,1	<00,01	<0,001	>0,5

P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

In case of clinical recovery, ECHOCG studies have shown (Table 1) that metabolic therapy was manifested by accelerated normalization of intracardiac hemodynamics, in comparison with basic therapy. Thus, in group III, the indicators of ESS, ESV,EDS, BV were completely normalized, and only EDO and EF did not reach the standard values (P<0.02, P<0.01).

Thus, the use of levocarnitine in the basic therapy of CAPM in children by normalizing the indicators of contractility of the left ventricle improves the functional state of the myocardium and indicates the appropriateness of this method for CAPM in children.

Table 2

State of ECHO-KG at discharge in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P_1	P_2	P_3
ESS, cm	2,44±0,11	3,04±0,14	2,48±0,12	<0,001	>0,5	<0,01
ESV, ml	22,39±1,01	37,45±1,64	21,39±1,39	<0,001	>0,5	<0,001
EDS, cm	3,72±0,17	4,05±0,16	3,78±0,15	>0,2	>0,5	>0,2
EDV, ml	58,48±2,13	71,84±4,51	58,37±2,29	<0,01	<0,01	>0,5
BV, ml	36,19±1,58	35,73±2,38	42,52±2,12	>0,5	>0,5	>0,5
EF, %	61,7±2,2	35,5±2,3	64,35±3,5	<0,001	<0,02	<0,001

P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

The study of the hemostasis system before the start of therapy in patients of group III (table 3) revealed the activation of plasma and platelet hemostasis and inhibition of fibrinolysis. In this group, in comparison with the control group, there was a decrease in the duration of APTT by 20.8%, fibrinogen levels by 29.5%, while at the same time, TT indicators increased by 84.7% and PTT by 28.2%. The detected decrease in FA activity by 13.3% and an increase in D-dimer by 41.6% are explained by the influence of fibrinogen degradation products, which increase upon activation of the plasmin system, indicating significant damage to the endothelium of the microvasculature, which reflected a violation in the homestasis system.

Table 3
The state of coagulation hemostasis at admission in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P	
APTT, sec	34,93±1,51	23,63±1,83	27,56±1,97	<0,001	P_1
				<0,01	P_2
				>0,2	P_3
TV, sec	10,47±0,59	21,06±0,79	19,34±1,01	<0,001	P_1
				<0,001	P_2
				>0,2	P_3
Fibrinogen, g/l	3,89±0,15	2,23±0,17	2,35±0,17	<0,001	P_1
				<0,001	P_2
				>0,5	P_3
PTV, sec	14,46±0,62	20,45±1,05	18,54±0,81	<0,001	P_1
				<0,001	P_2
				>0,2	P_3
FAP, sec	191,96±8,20	258,19±12,44	217,53±13,21	>0,2	P_1
				>0,1	P_2
				>0,5	P_3
D-dimer, ng/ml	252,5±12,0	361,57±30,52	357,56±19,37	<0,01	P_1
				<0,001	P_2
				>0,5	P_3

P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

It can be stated that the studied parameters of groups I and III, as well as those analyzed earlier upon admission of groups I and II of patients, practically did not differ from each other (P>0.2, P>0.5).

The results obtained are quite obvious, since the deviations of coagulation hemostasis were determined by the development of pneumonia and myocarditis, and at the same time, pathogenetic correction of changes was not fully carried out.

When the patients of group III were discharged, positive changes were noted in terms of hemostasiological parameters (table 4). Normalization of APTT (32.71±1.08 sec) and TT (10.64±0.55 sec) occurred, tendencies of normalization of fibrinogen (2.96±0.09 g/l), PTT (18.28± 0.21 sec), FAP (228.34±9.41 sec) and D-dimer (293.72±9.00 ng/ml), but not reaching the standard values (P<0.01, P<0.001) .

Table 4
The state of coagulation hemostasis at discharge in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P	
APTT, sec	34,93±1,51	32,70±1,26	32,71±1,08	>0,2	P1
				>0,2	P2
				>0,5	P3
TV, sec	10,47±0,59	11,36±0,63	10,64±0,55	>0,2	P1
				>0,5	P2
				>0,5	P3
Fibrinogen, g/l	3,89±0,15	2,69±0,16	2,96±0,09	<0,001	P1
				<0,001	P2
				>0,2	P3
PTV, sec	14,46±0,62	18,56±0,27	18,28±0,21	<0,001	P1
				<0,001	P2
				>0,5	P3
FAP, sec	191,96±8,20	233,38±9,09	228,34±9,41	<0,02	P1
				<0,01	P2
				>0,5	P3
D-dimer, ng/ml	252,5±12,0	302,17±9,20	293,72±9,00	<0,001	P1
				<0,01	P2
				>0,5	P3

P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

Thus, the use of levocarnitine in the complex therapy of blocking did not lead to a complete normalization of all studied parameters of blood coagulation. An insignificant hypercoagulable direction was determined due to persistent changes in the level of fibrinogen, the duration of PTT, the state of FA, and a decrease in D-dimer.

Upon admission to the hospital in the group of children receiving levocarnitine (Table 4.2.5), α-HBDH activity was increased by 27.7% and the value of the MVKK level was increased by 238.7%, compared with control values (P<0.001). At the same time, the degree of violations of cardiospecific enzymes in the compared groups I and III, as well as the previously analyzed groups I and II of patients, practically did not differ from each other (P>0.5).

Table 5
Indicators of cardiospecific enzymes at admission in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P	
α-HBDG u/l	115,1±6,1	192,2±11,2	193,3±9,76	<0,001	P_1
				<0,001	P_2
				>0,5	P_3
MVKK u/l	18,1±1,2	66,1±8,1	61,3±3,0	<0,001	P_1
				<0,001	P_2
				>0,5	P_3

P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

With the inclusion of levocarnitine in the complex of therapy in children with MHM (table 6), there is a decrease in the pathological activity of cardiospecific enzymes. In group III, a significant decrease and achievement of normative indicators of α-HBDG - 127.0 ± 6.3 units / l (P> 0.2) was revealed, which is 16.4% better in comparison with group I - 151.3 ± 8, 9 U/L (P<0.01). Despite the significant differences between groups III and I (P<0.01) and the downward trend, MVKK to 31.6±2.4 U/l and 40.3±2.4 U/l did not reach the standard values. At the same time, with the use of levocarnitine, the level of MVKK decreased by 21.6% compared with traditional therapy (P<0.01). The gradual recovery of the metabolism of the myocardial system in patients of group III, manifested by the restoration of α-HBDH, apparently reflects the effectiveness of the use of levocarnitine in the complex therapy of the disease.

Table 6
Indicators of cardiospecific enzymes at discharge in patients depending on the method of treatment (M±m)

indicators	control	group I	group III	P	
α-HBDG u/l	115,1±6,1	151,4±7,5	127,0±6,3	<0,001	P_1
				>0,2	P_2
				<0,01	P_3
MVKK u/l	18,1±1,2	40,3±2,4	31,6±2,4	<0,001	P_1
				<0,001	P_2
				<0,01	P_3

Note. P1, P2, P3 - significance of differences between the control and group I, control and group III and groups I and III, respectively

Conclusions. Thus, the inclusion of levocarnitine in the complex therapy of community-acquired pneumonia with myocarditis has a positive effect on the dynamics of clinical symptoms, contributes to the normalization of echocardiography data, the state of coagulation hemostasis and cardiospecific enzymes, allowing us to conclude that metabolic drugs are appropriate in the complex therapy of the disease in children.

Literature

1. Brin I. L., Dunaikin M. L., Lisitsina S. V. Problems of dosing carnitine preparations in childhood // Russian Bulletin of Perinatology and Pediatrics. - 2014. - T. 59. - №four.
2. Community-acquired pneumonia in children. Clinical guidelines. - M .: Original layout, 2015. - 64 p.
3. Geppe N.A., Rozinova N.N., Volkov I.K., MizernitskyYu.L. Working classification of the main clinical forms of bronchopulmonary diseases in children // Russian Respiratory Society. - M., 2009. - P.18.
4. Kalinina M. A., Kozlovskaya G. V., Kremneva L. F. Levocarnitine in pediatric practice // Russian Medical Journal. Medical review. - 2018. - Vol. 2. - №10. - S. 40-44.
5. KardzhavovaG.A.2 , Lim M.V., Urunova M.A. The etiological structure of community-acquired pneumonia in children with myocarditis // Journal of cardiorespiratory research -2021 №4.
6. Myocarditis in children. Clinical guidelines.Union of Pediatricians of Russia. M. 2016. 44 p.

7. Shavazi N.M.1 , Kardzhavova G.A.2 , Lim M.V.3 , Lim V.I., GaibullaevZh.Sh. // Clinical characteristics of acute myocarditis in children against the background of community-acquired pneumonia-Zh.
8. Shavazi N.M., Lim M.V., Karimova G.M. "The state of cardiac hemodynamics according to echocardiographic studies in young children with pneumonia complicated by infectious toxic shock". Bulletin of emergency medicine.№3, 2013. C. 289-290.
9. Shavazi N.M.1, Kardzhavova G.A. Diagnostic value of cardiac markers in children with myocarditis against the background of community-acquired pneumonia //Zh. Problems of biology and medicine - 2022. №2 (135).
10. Shavazi N.M., Kardzhavova G.A., Lim M.V., Gaybullayev ;a;J.Sh. Monitoring the etiological aspects of community-acquired pneumoniya in children //J. Problems of biology and medicine– 2021. №3 (128).
11. Shavazi N.M., Kardzhavova G.A., Lim M.V., Atayeva M.S. // Features of the course of community-acquired pneumoniya in children with miocardites// J. Questions of science and education-2020. №33(117).