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VALUE OF CARDIAC MARKERS IN SICK CHILDREN COMMUNITY AQUIRED PNEUMONIA WITH MYOCARDITIS

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ANNOTATION

Currently, in cardiology, it is important to determine troponins as a biochemical marker of cardiomyocyte necrosis. The aim of this work was to identify markers of myocardial damage and identify the most significant of them in children with pneumonia. On the basis of the SF RSCEMA, 150 patients aged from 6 months to 7 years old were examined. The parameters of troponin I, α-HBDG, MVKK were determined. The parameters of troponin I, α-HBDG, MVKK were determined. The exclusion criteria were congenital heart defects (CHD), cardiac arrhythmias, genetic anomalies, chronic bronchopulmonary diseases, if changes in troponins in the blood were observed. This is due to the absence of episodes of acute hypoxia and death of cardiomyocytes. The results of the study showed that studies of clinical symptoms, echocardiography, hemostasis and cardiac markers indicate the peculiarities of the course of community-acquired pneumonia with myocarditis in children and need further confirmation, including analysis of the correlation relationships between them.

Key words: myocarditis, children, cardiac troponins I, pneumonia, heart failure.

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ЗНАЧЕНИЕ СЕРДЕЧНЫХ МАРКЕРОВ У БОЛЬНЫХ ДЕТЕЙ С ВНЕБОЛЬНИЧНОЙ ПНЕВМОНИЕЙ С МИОКАРДИТОМ

АННОТАЦИЯ

В настоящее время в кардиологии актуальном является определение тропонинов как биохимического маркера некроза кардиомиоцитов. Целью данной работы явилось выявление наиболее значимых маркеров поражения миокарда у детей с внебольничной пневмоние с миокардитами. На базе СФ РНЦЭМП обследовано 150 больных в возрасте от 6 мес до 7 лет. Определяли показатели тропонина I, α-ГБДГ, МВКК. Критерием исключения служили врожденные пороки сердца (ВПС), нарушения сердечного ритма, генетические аномалии,

хронические бронхо-легочные заболевания, при которых закономерно отмечается изменение тропонинов в крови. Это связано с отсутствием эпизодов острой гипоксии и гибели кардиомиоцитов. Результаты исследования показали, что исследования клинической симптоматики, эхокардиографии, показателей гемостаза и кардиальных маркеров свидетельствуют об особенностях течения внебольничной пневмонии с миокардитом у детей и нуждаются в дальнейшем подтверждении, в том числе анализе корреляционных связей между ними.

Ключевые слова: миокардит, дети, сердечные тропонины I, пневмония, сердце.

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ШИФОХОНАДАН ТАШҚАРИ ПНЕВМОНИЯ ВА МИОКАРДИТ БИЛАН КАСАЛЛАНГАН БОЛАЛАРДА ЮРАК МАРКЕРЛАРИНИНГ АХАМИЯТИ

АННОТАЦИЯ

Ҳозирги вақтда кардиологияда тропонинларни кардиомиоцитлар некрозининг биокимёвий белгиси сифатида аниқлаш долзарб ҳисобланамоқда. Ушбу ишнинг мақсади миокардит фонида кечувчи шифохонадан ташқари пневмония билан касалланган болаларда миокард зарарланишининг энг муҳим белгиларини аниқлаш бўлди. 6 ойликдан 7 ёшгача бўлган 150 нафар бемор РШТЁИМ СФ базасида текширилди. Тропонин I, а-ГБДГ, МВКК параметрлари аниқланди. Истисно мезонлари туғма юрак нуқсонлари (ТЮН), юрак аритмиялари, генетик аномалиялар, сурункали бронхо-ўпка касалликлари бўлиб, уларда табиий равишда қондаги тропонинлар ўзгариши кузатилади. Бу ўткир гипоксия эпизодларининг йўқлиги ва кардиёмиоцитларнинг ўлими билан боғлиқ. Тадқиқот натижалари шуни кўрсатдики, клиник симптомлар, эхокардиография, гемостаз ва юрак маркерларини ўрганиш болаларда миокардит билан кечувчи томонидан орттирилган пневмония кечишининг ўзига хослигини кўрсатади ва улар ўртасидаги корреляцияни таҳлил қилиш, шу жумладан қўшимча тасдиқлашни талаб қилади.

Калит сўзлар: миокардит, дети, юрак тропонинлари I, пневмония, юрак.

Relevance. In recent years, in cardiology, increasing importance is attached to the composition of the troponin complex of cardiomyocytes as the most sensitive and specific biochemical marker of myocardial necrosis.

Troponins (I, T and C) in a ratio of 1:1:1 are part of the troponin complex associated with tropomyosin, which, together with actin, forms small filaments of myocytes - the main component of the contractile apparatus of striated muscle cells. All three troponins arise in the calcium-dependent regulation of the release-relaxation act.

Cardiac troponins T and I were differentiated from similarity of skeletal muscle proteins by an immunological method using monoclonal antibodies, which are used in their immunoassay methods. Cardiac troponin C is opposite to troponin T and is completely identical in its restriction to muscle troponin C and therefore is not a cardiospecific protein [4].

Over the past few years, the use of troponins in pediatrics, mainly in neonatology, has also begun to be determined [2,6]. In the discovered works, the detected newborns were carried out at the 1st week of life; in the study, children with CNS pathologies, premature, underweight were found. In domestic intelligence, the determination of troponin T in children with CHD was carried out by P.I. Slobin [3] noted elevated values of troponin T in this group of patients in the first days of life and a decrease in its level at 2–3 weeks. Yu.V. Shmatkova in the field of application [7] received an increase in the level of troponin I in children aged 3 to 16 years with symptoms of circulatory failure (CK) IIB-III degree and subsequently died.

Troponins and cardiospecific enzymes MVKK and α-HBDG are the most sensitive and specific organ biomarkers for various anxiety disorders, allowing for diagnostic and prognostic

capabilities in myocarditis. However, at present, studies of this problem in pediatric practice are used only indicative**.**

The aim of the study was to identify the most diagnostic significant cardiospecific markers of heart damage (troponin I, α-HBDG, MVCC) in children with community-acquired pneumonia.

Materials and methods of research

The study included 150 children who were hospitalized with community-acquired pneumonia at the age of 6 months to 7 years, including 120 patients with concomitant myocarditis who were hospitalized in departments I, II of emergency pediatrics and pediatric resuscitation of the Samarkand branch of the Republican Scientific Emergency Medical Center from 2019 to 2022.

Patients at the 1st stage of the study were divided into 4 groups:

Group A included 30 children with community-acquired pneumonia without myocarditis.

Group B included 60 patients with uncomplicated community-acquired pneumonia with myocarditis.

Group C included 60 patients with complicated course of community-acquired pneumonia with myocarditis.

Group B + C, consisting of groups B and C, referred to as a group of children with community-acquired pneumonia with myocarditis (120 patients).

In the study of troponin I, we used gradations of the level of the cardiac marker. So the interval with a low level of troponin I 0-0.1 ng / ml - was regarded as a variant of the norm; an interval with an average level of 0.2-0.3 ng/ml indicated moderate myocardial damage and at a level of troponin I in the blood of 0.4 ng/ml and above, a severe lesion, up to severe organic damage to the myocardium .

When quantifying the level of troponin I in children with CAP (Table 3.3.1), the content did not exceed the limit of reference values (0-0.1 ng / ml) was observed in 36.7% of patients, in the range of 0.2-0.3 ng/ml in 6.7% and 0.4 ng/ml and > in 3.3% of patients in comparison with uncomplicated course of CAP with myocardites in which it was detected in 10.0% (P=0.002), 58.3% (P= 0.0010.266) and 10.0% (P=0.266) of cases, respectively, according to our gradations.

It is important to note that the high frequency of detecting an elevated troponin I value (78.3%) in patients with CAP with myocardites , compared with SV, can be explained by damage to cardiomyocytes during the development of myocarditis, followed by an increase in specific proteins in the blood.

Table 1

The frequency of detection of troponin I in patients with community-acquired pneumonia and uncomplicated course of community-acquired pneumonia with myocarditis

index	Detection frequency (%)		χ2	P	OR	ДИ min	ДИ max
	Group A	Group B					
troponin I 0-0.1 ng/ml	10,0	36,7	9,28	0,002	0,48	0,06	0,59
troponin I 0.2-0.3 ng/ml	58,3	6,7	22,05	0,001	2,01	4,27	89,94
troponin I 0.4 ng/ml and >	10,0	3,3	1,24	0,266	1,32	0,37	28,07
discovered	78,3	46,7	9,18	0,002	1,72	1,61	10,62
Not found	21,7	53,3	9,18	0,002	0,58	0,09	0,62

Note: indicators χ2, P, OR, CI min and CI max between groups

The results of the study of determining the level of troponin I presented in Table 3.3.2 show that in the complicated course of CAP with myocardites , the overall detection rate of troponin I (93.3%), so distributed gradations: at 0-0.1 ng / ml in 3.3% patients, 0.2-0.3 ng/ml in 65.0% and at 0.4 ng/ml and more in 25.0%, significantly differed from the frequency of detection in CAP (P=0.001), indicating a more pronounced myocardial injury.

Table 2

The frequency of detection of troponin I in patients with community-acquired pneumonia and complicated course of community-acquired pneumonia with myocarditis

index	Detection frequency (%)		χ2	P	OR	ДИ min	ДИ max
	Group B	Group C					
troponin I 0-0.1 ng/ml	3,3	36,7	17,98	0,001	0,20	0,01	0,29
troponin I 0.2-0.3 ng/ml	65,0	6,7	27,44	0,001	2,22	5,63	120,02
troponin I 0.4 ng/ml and >	25,0	3,3	6,42	0,011	1,54	1,21	77,17
discovered	93,3	46,7	25,20	0,001	4,00	4,62	55,42
Not found	6,7	53,3	25,20	0,001	0,25	0,02	0,22

Note: indicators χ2, P, OR, CI min and CI max between groups

As shown in Table 3, in the group of patients CAP with myocardites (group B + C), the frequency of troponin I was registered in 85.8% of patients, in the range of 0.2-0.3 ng / ml in 61.7% of children and in interval of 0.4 and more ng/ml in 17.5% of patients, which is significantly higher than in children with CAP. These results indicate that the concentration of troponin I in patients with myocarditis increases significantly and the possibility of determining the frequency of detection of troponin I in patients as an objective diagnostic marker of CAP with myocarditis.

Table 3

The frequency of detection of troponin I in patients with community-acquired pneumonia and community-acquired pneumonia with myocarditis.

index	Detection frequency (%)		χ2	P	OR	ДИ min	ДИ max
	Group B +C	Group A					
troponin I 0-0.1 ng/ml	6,7	36,7	12,96	0,001	0,36	0,04	0,43
troponin I 0.2-0.3 ng/ml	61,7	6,7	24,64	0,001	2,10	4,90	103,60
troponin I 0.4 ng/ml and >	17,5	3,3	3,89	0,048	1,46	0,80	53,06
discovered	85,8	46,7	16,36	0,001	2,36	2,64	20,89
Not found	14,2	53,3	14,65	0,001	0,46	0,06	0,42

Note: indicators χ2, P, OR, CI min and CI max between groups

Considering the results of a comparative analysis (Table 4), it should be stated that in patients with a complicated course of CAP WITH MYOCARDITES , only in the range of 0.4 and > ng/ml, there were significant differences of 25.0% (χ2=4.23, P=0.040) in comparison with an uncomplicated

course of the disease, probably due to the fact that as the disease worsens, the degree of myocardial damage increases.

Table 4

The frequency of detection of troponin I in patients with uncomplicated and complicated course of community-acquired pneumonia with myocarditis

index	Detection frequency (%)		χ2	P	OR	ДИ min	ДИ max
	Группа A	Группа C					
troponin I 0-0.1 ng/ml	10,0	3,3	1,24	0,266	1,32	0,37	28,07
troponin I 0.2-0.3 ng/ml	58,3	65,0	0,58	0,445	0,89	0,28	1,75
troponin I 0.4 ng/ml and >	10,0	25,0	4,23	0,040	0,60	0,09	0,98
discovered	78,3	93,3	3,24	0,072	0,72	0,05	1,23
Not found	21,7	6,7	3,24	0,072	1,38	0,81	18,44

Note: indicators χ2, P, OR, CI min and CI max between groups

The study showed the detection of the frequency of troponin I in 85.8% of patients with CAP with myocardites (χ2 =16.36, P=0.001), determination in the range of 0.2-0.3 ng/ml in 31.7% of cases (χ2 = 24.64, P=0.001), in the range of 0.4 and more ng/ml in 17.5% of cases (χ2=3.89, P=0.048), which allows us to recommend this indicator as a diagnostic criterion and determine the severity of the course diseases.

The study of indicators of cardiospecific enzymes in children with CAP (table 5) revealed a significant increase in the level of α-HBDG by 15.34% and MVKK by 14.4% compared with the control group (P<0.001), which are the result of the negative effect of hypoxic , toxic and other pathological changes pathogenetically arising from pneumonia in the CCC in patients.

Table 5

Indicators of cardiospecific enzymes in patients with community-acquired pneumonia.

index	Control (M±m)	Group A (M±m)	P
α-HBDG u/l	115,1±6,1	132,8±7,8	<0,001
MVKK u/l	18,2±1,1	20,7±1,2	<0,001

Note: P - significance of differences between groups

In children with uncomplicated course of CAP with myocardites (Table 3.3.6), the levels of α-HBDG were significantly higher - 173.6±8.6 U/l and MVCC 54.3±3.5 U/l (P<0.001) in comparison with patients with CAP, which naturally indicates more pronounced changes in the myocardium in this group of patients.

Table 6

Parameters of cardiospecific enzymes in patients with community-acquired pneumonia and uncomplicated course of community-acquired pneumonia with myocarditis.

Index	Group A (M±m)	Group B (M±m)	P
α-HBDG u/l	132,8±7,8	173,6±8,6	<0,001
MVKK u/l	20,7±1,2	54,3±3,5	<0,001

Note. P - significance of differences between groups

As indicated in table 7, among children with a complicated course of CAP with myocardites , significantly high values of cardiospecific enzymes were observed, as for α-HBDG u/l - 215.3±10.3 u/l and MVKK - 69.2±3.8 u /l in comparison with the group of patients with CAP (P<0.001).

Table 7

Parameters of cardiospecific enzymes in patients with community-acquired pneumonia and complicated course of community-acquired pneumonia with myocarditis (M±m).

Index	Group A (M±m)	Group C (M±m)	P
α-HBDG u/l	132,8±7,8	215,3±10,3	<0,001
MVKK u/l	20,7±1,2	69,2±3,8	<0,001

Note. P - significance of differences between groups

As shown in Table 8, in children with uncomplicated and complicated course of CAP with myocardites , the results of the examination, confirming myocarditis and revealing higher levels of both cardiospecific enzymes (P<0.01, P<0.001), confirmed their diagnostic significance in determining the state of the myocardial system and the course of the disease.

Table 8

Parameters of cardiospecific enzymes in patients with uncomplicated and complicated course of community-acquired pneumonia with myocarditis (M±m).

Index	Group B (M±m)	Group C (M±m)	P
α-HBDG u/l	173,6±8,6	215,3±10,3	<0,001
MVKK u/l	54,3±3,5	69,2±3,8	<0,01

Note. P - significance of differences between groups

In HLM (group B + C), pathological manifestations of CVS (table 9) are accompanied by a significant increase in the level of cardiospecific enzymes in α-HBDG by 46.4% and in MVKK by 298.9% (P<0.001) compared with VP, indicating about pronounced pathogenetic changes in the myocardium, aggravating the course of hypoxic processes in the body with community-acquired pneumonia.

Table 9

Parameters of cardiospecific enzymes in patients with community-acquired pneumonia and community-acquired pneumonia with myocarditis (M±m).

Index	Group A (M±m)	Group B+C (M±m)	P
α-HBDG u/l	132,8±7,8	194,6±10,6	<0,001
MVKK u/l	20,7±1,2	61,8±2,7	<0,001

Note. P - significance of differences between groups

Research results. Thus, the state of cardiac markers in CAP with myocardites in children is characterized by an increase in the frequency of detection of troponin I in 85.8% ($\chi 2 = 16.36$, P = 0.001), in the range from 0.2-0.3 ng / ml to 31.7 % ($\chi 2 = 24.64$, P=0.001), from 0.4 and more ng/ml in 17.5% of cases ($\chi 2 = 3.89$, P=0.048), the presence of cardiospecific hyperenzymemia according to α-HBDG - 194, 6±10.6 u/l and CPK MB-fraction - 61.8±2.7 u/l (P<0.001) in comparison with VP. The study allows us to recommend the frequency of detection of troponin I, the levels of α-HBDG and CPK MB-fraction as diagnostic criteria, to determine the severity of community-acquired pneumonia with myocarditis, and the need for corrective measures.

The results of the study of clinical symptoms, echocardiography, hemostasis and cardiac markers indicate the peculiarities of the course of community-acquired pneumonia with myocarditis

in children and require further confirmation, including an analysis of the correlation relationships between them.

The discussion of the results.

The range of diagnostic significance of the troponin I level (diagnostic window) is mainly limited to 3–7 days, varying significantly in individual patients. For troponin T, this period is longer and can be prolonged up to 12–14 days [8]. Therefore, troponins T and I can also be regarded as late diagnostic markers that allow the detection of “missed” myocardial dysfunction. The diagnostic sensitivity of troponins reaches 100% if they are measured in the range of more than 12-14 hours from the onset of symptoms of heart failure. Such sensitivity of troponins with a high degree of specificity allows us to consider these myocardial markers as "gold standards" in the diagnosis of myocarditis, which have clear advantages over CPK-MB and LDH_1 [1,9].

For the reliability of the results, we carried out a correlation analysis, in which we used the values of bed-days, ejection fraction, D-Dimer and MVKK, as the most demonstrative criteria for PPM, with a high degree of significant differences in the comparison of PEP. A correlation analysis was carried out in patients of groups A, B, C and BC, followed by the construction of a correlation graph, a trend line and an approximation reliability value. Correlation analysis data for EP show that between bed-days, EF, D-dimer and MVKK that between bed-days, EF, D-dimer and MVKK there were very weak and weak correlation negative and positive relationships between themselves and the correlation graph between In terms of bed-days to EF and EF to D-dimer, there is a rather sharp divergence of points on both sides of the trend line, with insufficient approximation accuracy R2=0.0726 and R2=0.0883.

Conclusions

The analysis of cardiac markers revealed the frequency of troponin I in 85.8% of patients with CAP with myocardites (group B + C), in the range of 0.2-0.3 ng / ml in 31.7% of cases, in the range of 0.4 and more ng/ml in 17.5% of cases, in comparison with EP in which it was determined in 36.7%, 6.7% and 3.3% of patients, respectively, gradations, which allows us to recommend them as a diagnostic criterion and determine the severity of the course diseases.

Community-acquired pneumonia with myocarditis is accompanied by a significant increase in the level of cardiospecific enzymes by α-HBDG by 46.4% and by MVKK by 298.9% ($P<0.001$) in comparison with EP and indicates more pronounced pathogenetic changes developing with myocardial damage, which in in turn exacerbates the course of hypoxic processes in the body with community-acquired pneumonia.

The results of the frequency of detection of troponin I and the level of α-HBDG - and MB-fraction of CPK allow us to recommend them as diagnostically significant markers of severity and the need for corrective measures of the disease.

To make a diagnosis of myocardial dysfunction in patients with acute heart failure caused by community-acquired pneumonia, the determination of serum proteins-markers of cardiomyocyte damage (α-HBDG and CPK MB-fractions) is indicated. Evaluation of troponin I elevation in infants should be carried out after the development of guidelines for this age group.

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