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**ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE**

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EVALUATING OF CARDIORENAL SYNDROME IN CHILDREN WITH ACUTE GLOMERULONEPHRITIS FOR TIMELY DIAGNOSIS AND CORRECTIVE THERAPY

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✓ *Resume*

In the structure of childhood morbidity, the problem of improving early diagnosis and timely treatment of acute glomerulonephritis in children is currently of particular relevance. In the last decade, analyzing the features of the course of nephrological diseases, there has been an interest in studying the involvement of the cardiovascular system in the pathological process. The use complex diagnostic methods makes it possible to determine the prognosis of the disease and overcome the difficulties of diagnosis and treatment. Early diagnosis of structural and functional changes in the cardiovascular system and verification of risk factors create prerequisites for choosing rational ways to prevent, cardiorenal syndrome with the help of metabolic drug like levocarnitine in patients with the initial stages of acute glomerulonephritis.

Key words: acute glomerulonephritis, children, the cardiovascular system, levocarnitine, cardiorenal syndrome.

ОЦЕНКА КАРДИОРЕНАЛЬНОГО СИНДРОМА У ДЕТЕЙ С ОСТРЫМ ГЛОМЕРУЛОНЕФРИТОМ ДЛЯ СВОЕВРЕМЕННОЙ ДИАГНОСТИКИ И КОРРЕКТИРУЮЩЕЙ ТЕРАПИИ

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✓ *Резюме*

В структуре детской заболеваемости в настоящее время особую актуальность приобретает проблема совершенствования ранней диагностики и своевременного лечения острого гломерулонефрита у детей. В последнее десятилетие при анализе особенностей течения нефрологических заболеваний появился интерес к изучению вовлечения сердечно-сосудистой системы в патологический процесс. Использование комплексных методов диагностики позволяет определить прогноз заболевания и преодолеть трудности диагностики и лечения. Ранняя диагностика структурно-функциональных изменений сердечно-сосудистой системы, и верификация факторов риска создают предпосылки для выбора рациональных путей профилактики кардиоренального синдрома с помощью метаболического препарата левокарнитина у больных с начальными стадиями острого гломерулонефрита.

Ключевые слова: острый гломерулонефрит, дети, сердечно-сосудистая система, левокарнитин, кардиоренальный синдром.

O'TKIR GLOMERULONEFRIT BILAN OG'RIGAN BOLALARDA KARDIORENAL SINDROMINI O'Z VAQTIDA DIAGNOSTIKASI VA KORREKTIV TERAPIYASI

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✓ *Rezyume*

Bolalar kasalliklari tarkibida o'tkir glomerulonefritni erta tashxislash va o'z vaqtida davolashni takomillashtirish muammosi bugungi kunda alohida dolzarblik kasb etmoqda. So'nggi o'n yilda nefrologik kasalliklarning kechish xususiyatlarini tahlil qilinganda, patologik jarayonda yurak-qon tomir tizimining ishtirokini o'rganishga qiziqish paydo bo'ldi. Murakkab diagnostika usullaridan foydalanish kasallikning prognozini aniqlashga, diagnostika va davolashdagi qiyinchiliklarni bartaraf etishga imkon beradi. Yurak-qon tomir tizimidagi strukturaviy va funktsional o'zgarishlarni erta tashxislash va xavf omillarini tekshirish o'tkir glomerulonefritning dastlabki bosqichlarida bo'lgan bemorlarda levokarnitin kabi metabolik dori yordamida kardiorenal sindromning oldini olishning oqilona usullarini tanlash uchun zarur shart-sharoitlarni yaratadi.

Kalit so'zlar: o'tkir glomerulonefrit, bolalar, yurak-qon tomir tizimi, levokarnitin, kardiorenal sindrom.

Relevance

According to the World Health Organization about 470 thousand new cases of acute post-streptococcal glomerulonephritis (AGN) are registered worldwide per year, of which 400 thousand are in childhood [3,10,11]. In the last decade, analyzing the features of the course of nephrological diseases, there has been an interest in studying the depth of involvement in the pathological process of the cardiovascular system in glomerulonephritis [1,5-9,14]. In acute glomerulonephritis with cardiorenal syndrome, the complex of clinical and symptomatic manifestations depends on many factors. The manifestation of the course of the disease to a certain extent depends on the age of the child, the stage and form of the underlying disease, concomitant pathology and the severity of disorders in the cardiovascular system [10-12]. Thus, at present, the improvement of treatment and diagnostic tactics in patients with acute glomerulonephritis complicated by cardiorenal syndrome is an urgent and insufficiently studied problem, and requires the development of modern effective methods for diagnosing and treating patients with this pathology.

At the first changes in the heart at the cellular level, an energy shortage appears during the aerobic process. The biochemical basis for the development of heart failure in renal pathologies includes a violation of the energy metabolism of the heart muscle [4]. Under conditions of ischemia, reduced energy, as well as reactive oxygen species produced by mitochondria, contribute to cardiac dysfunction. It is now increasingly recognized that changes in mitochondrial function, membrane integrity, and cytochrome C release actively promote cellular apoptosis. Mitochondrial function is modulated by environmental signals in various cardiovascular diseases, and under experimental conditions, the prevention of mitochondrial signals can reduce cell damage and apoptosis. So, an approach is needed to improve the metabolism of the heart for the full functioning of the cardiovascular system in pathologies of organs and systems, when there is an additional load on the heart in the form of hypervolemia and uremia. In search of a drug with antioxidant and lyotropic properties, we approached levocarnitine - an amino acid that is synthesized in the kidneys and is insufficient in chronic kidney disease (CKD) as a means for correcting metabolic processes; has a metabolic, anabolic, antihypoxic effect. Competitively displacing glucose, it turns on the shunt of fatty acid metabolism, the activity of which is not limited by oxygen (unlike aerobic glycolysis), and therefore levocarnitine is effective in acute hypoxia and many critical conditions [2,13].

Purpose of the study: To study the aspects of cardiorenal syndrome in children with acute glomerulonephritis for timely diagnosis and corrective therapy.

Materials and methods

The object of the study was 105 children hospitalized with acute glomerulonephritis in the nephrology department of the Samarkand Regional Children's Multidisciplinary Medical Center from 2019 to 2022 inclusive. The subject of the study is the totality of the results of clinical, laboratory, functional and instrumental research methods in patients with acute glomerulonephritis.

To determine the effectiveness of the treatment of AGN with cardiorenal syndrome, patients of the main group were divided into 2 groups. Group I consisted of 33 (48.5%) children who received conventional therapy in our clinic from 2019 to 2020. inclusive group II included 35 (51.5%) patients with AGN with cardiorenal syndrome treated according to the method we developed (2021-2022). The traditional treatment of acute glomerulonephritis in group I of the MG included drugs included in the

standard of specialized medical care for children with acute glomerulonephritis. In subgroup II of the main group, in addition to traditional treatment we used levocarnitine.

Levocarnitine - has a metabolic, anabolic, antihypoxic and antithyroid effect, activates fat metabolism, stimulates regeneration, increases appetite. Levocarnitine is a natural substance related to B vitamins. It is well absorbed when taken orally. The maximum concentration of the drug is reached after 3 hours, the therapeutic concentration is maintained for 9 hours. Easily penetrates into the liver and myocardium, more slowly - into the muscles. It is excreted by the kidneys mainly in the form of acyl esters. The reported effects of levocarnitine are: (1) improvement in renal anemia, (2) improvement in cardiac function, (3) effect on muscle spasm and asthenia, (4) anti-atherogenic effect, (5) antioxidant and anti-inflammatory effect, and (6) inhibitory effect on hypotension. Applied in children aged 3-6 years, 200 mg; 7-12 years - 400 mg, 13-18 years - 800 mg per day for 1 month.

Result and discussion

Biochemical and general blood tests, used as one of the indicators of the severity of the condition of patients with AGN, were also used by us as criteria for the effectiveness of the treatment. Table 1 shows the results of a blood test in patients with AGN with cardiorenal syndrome on days 5-7 after the start of treatment by traditional and proposed methods.

Table 1

Dynamics of the main laboratory parameters of a blood test depending on the method of treatment (n=68)

№	laboratory indicators	groups / mean values (M±m)		
		group I (n=33)	group II (n=35)	p
1	Hemoglobin, g/l	81,7±6,7	83,2±7,3	0.5
2	Leukocytes, *10 ⁹ /L	6,2±0,5	5,8±0,6	0.005
3	ESR, mm/h	15,5±2,5	10,2±1,1	0.001
4	Urea, mmol/l	9,6±0,8	6,8±0,7	0.001
5	Creatinine, μmol/l	125,4±5,4	102,8±7,2	0.001
6	Total cholesterol, mmol/l	5,7±0,8	4,42±0,5	0.001
7	Total protein, mmol/l	46,3±2,2	54,5±2,7	0.001
8	Albumin, mmol/l	26,4±2,7	35,7±2,6	0.001
9	GFR, ml/min/1.73m ²	65,8±3,2	78,2±4,4	0.001

As shown in Table 1, ESR in group II was significantly lower than in group I of the OG. Differences in this criterion of treatment effectiveness are significant, p=0.001. Urinary parameters of the biochemical blood test on 10 days after the start of treatment in the group with the proposed method of therapy were significantly (p=0.001) lower than the results of patients with conventional treatment. In group I, urea was at the level of 9.6±0.8 mmol/l, creatinine 125.4±5.4 μmol/l, and in subgroup II - 6.8±0.7 mmol/l and 102.8±7.2 μmol/l, respectively. The blood content of total protein and albumin in subgroup I was 46.3±2.2 and 26.4±2.7 mmol/l, in group II - 54.5±2.7 and 35.7±2.6 mmol /l, respectively, which is significantly (p<0.05) higher. The glomerular filtration rate is also an order of magnitude better in patients with the use of levocarnitine in the list of prescriptions, 78.2±4.4 versus 65.8±3.2 ml/min/1.73m², the differences in this criterion are significant, p=0.001 . These data clearly demonstrate the advantages of the proposed tactics for the treatment of AGN with cardiorenal syndrome.

In patients with AGN complicated by cardiorenal syndrome in order to control the dynamics of deviations from the normative indicators of electrocardiograms of patients with AGN, we performed an ECG study before discharge from the hospital. Table 2 clearly demonstrates changes in electrocardiograms in patients of both groups of the main clinical group.



Table 2**Results of electrocardiography in patients with acute glomerulonephritis with cardiorenal syndrome before discharge (n=68)**

№	ECG changes	groups / number of observations	
		group I (n=33) subgroup II (n=35)	group I (n=33) subgroup II (n=35)
1	Metabolic changes in the myocardium	7 (21,2%)	3 (8,6%)
2	Blockade of the legs of the bundle of His	3 (9,1%)	1 (2,9%)
3	Blockade of the intraventricular conduction system	3 (9,1%)	1 (2,9%)
4	Hypertrophy of the ventricular myocardium	7 (21,2%)	3 (8,6%)
5	Sinus tachycardia	5 (15,2%)	3 (8,6%)
6	Sinus bradycardia	4 (12,1%)	2 (5,7%)
7	Arrhythmia	4 (12,1%)	2 (5,7%)
8	Electrical deviation	3 (9,1%)	1 (2,9%)
9	axes of the heart	1 (3,0%)	1 (2,9%)

As shown in table 2, after treatment for AGN complicated by cardiorenal syndrome, patients in group II compared with group I had significantly better electrocardiogram parameters. After traditional treatment, out of 33 children, 17 (51.5%) had 37 deviations of various types on the electrocardiogram. Before discharge, 10 (28.6%) of 35 patients treated according to our proposed method had 17 episodes of disturbances on electrocardiograms. In group II of the main group, metabolic changes in the myocardium and ventricular myocardial hypertrophy decreased by 12.6%, the frequency of occurrence of bundle branch block, blockade of the intraventricular conduction system and deviation of the electrical axis of the heart - by 6.2%, sinus tachycardia was less common by 6.6%, and arrhythmias and sinus bradycardia - by 6.4% ($p>0.05$). The patients also underwent echocardiography at discharge. The results of Echo-KG in a comparative aspect in the groups are shown in Table 3.

Table 3**Dynamics of echocardiography results in children with cardiorenal syndrome (n=68)**

№	Echo-KG changes	groups / number of observations	
		group I (n=33)	group II (n=35)
1	Mitral valve prolapse	2 (6,1%)	0
2	Mitral regurgitation	2 (6,1%)	0
3	Hypertrophy of the ventricular myocardium	3 (9,1%)	1 (2,9%)
4	Dyskinesia of the walls of the ventricles	3 (9,1%)	1 (2,9%)
5	Tricuspid valve regurgitation	1 (3,0%)	1 (2,9%)
6	Ejection fraction, %	69,5±2,1	72,8±3,2

The data in Table 3 demonstrate the positive dynamics of echocardiographic data in patients with AGN with cardiorespiratory syndrome. In patients of group II, there was a decrease in the incidence of ventricular myocardial hypertrophy and ventricular wall dyskinesia by 6.2%. Mitral valve prolapse and mitral regurgitation in patients treated according to the proposed method were not diagnosed at discharge in any case. At the same time, the ejection fraction was higher in group II (72.8±3.2%) compared to group I (69.5±2.1%), however, the differences were not significant.

Conclusions

After treatment for AGN complicated by cardiorenal syndrome, in patients of group II, compared with group I, the electrocardiogram parameters were significantly better. After traditional treatment, out of 33 children, 17 (51.5%) had 37 deviations of various types on the electrocardiogram. Before discharge, 10 (28.6%) of 35 patients treated according to our proposed method had 17 episodes of disturbances on electrocardiograms. Echocardiograms in patients of group II showed in patients treated according at discharge in any case the differences were not significant.

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