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Condition of the Cardiovascular System in Children with Chronic Pyelonephritis on the Background of Hyperuricemia

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Abstract

Comparative clinical-laboratory and instrumental evaluation of 62 children with chronic pyelonephritis was carried out. It was revealed that the increase in the level of MC significantly influences the development and progression of the cardiovascular system disease, which was expressed in higher blood pressure level, statistically higher frequency of pathological changes at ECG, as well as EchoKG, which is expressed in higher frequency of left ventricular hypertrophy.

Keywords: *chronic pyelonephritis, purine metabolism, children, cardiovascular system.*

1. Introduction

Both nephrologists and cardiologists recognize the fact that most of the currently known risk factors for cardiovascular disease (arterial hypertension, obesity, diabetes mellitus, dyslipoproteinemia, microalbuminuria, etc.) are also risk factorsfor chronic kidney disease (CKD). An inverse relationship has been established, i.e. the effect of renal pathology on the frequency of detection of cardiovascular diseases. This fact is especially relevant in case of violation of uric acid metabolism (UA), so the literature data of the latter testify to the significant role of UA in the development of cardiovascular disease. However, these issues are intensively studied in therapeutic practice, but they are undoubtedly relevant for pediatric practice.

The aim of the study: to study the peculiarities of the clinical course and the state of the cardiovascular system in sick children with chronic pyelonephritis against the background of impaired uric acid metabolism

TEST Engineering & Management

November-December 2019
ISSN: 0193-4120 Page No. 1551 - 1554

2. Material and methods of research

62 children aged 10 to 16 years were examined, the average age was 13.3±1.9 years. Girls were 41 (66.1%) and 21 (33.9%) were boys. The criteria for inclusion in the study were patients with chronic pyelonephritis. Children were divided into 2 groups of 1 group and 34 children with chronic pyelonephritis against the background of uraturia (I - group), in 28 children were diagnosed with primary chronic pyelonephritis (II - group). All children were examined at the nephrological department of the Khorezm Regional Specialized Multidisciplinary Medical Center and at the children's department of the Urgench branch of TMA. With the help of two-dimensional Doppler echocardiography we studied the state of the left ventricular myocardium along its entire length, the state of the interventricular septum, mitral, tricuspidal and aortic valves. BP determination was carried out by a simple method of Korotkov, ECG study was conducted on a 6-channel electrocardiograph "CARDIOFAX ECG 882-OK", heart echocardiography was conducted on the device "SIM-5000". The nature of urinary syndrome was determined on the basis of the general analysis of urine and the quantitative method - the Nechiporenko sample, daily excretion of protein. The functional state of the kidneys was assessed by the results of Zimnitsky's test, the level of urea and creatinine in the blood serum, and the rate of glomerular filtration (endogenous creatinine clearance) calculated by Schwartz's formula. The level of uric acid in blood plasma and daily urine was evaluated by a biochemical analyzer. Ultrasound, kidney and bladder tests were performed on all patients. Excretory urography, myctal cystography, cystoscopy were performed according to indications. The complex of examination was supplemented by crystallographic examination of blood serum and urine by the method (Fominoi G.N. 2009).

3. Research results

A third of children in Group 1 showed some reduction in diuresis (29.4%) and only 1/5 of children with primary chronic pyelonephritis (21.4%). On average, 79.4% of children had a sharply acidic urine reaction in the overall urine pH analysis. pH of urine <5.75 was diagnosed in one third of the surveyed children of the 1st group (32.3%). Given the biochemical properties of uric acid, this group of children is a special risk group for gout development. The microscopy of the general urine analysis showed that in the main mass of the groups being compared there was a pronounced leukocyturia, mainly due to neutrophils (58.8% and 60.7%), the average indices of which were 35.47±8.4 and 31.23±6.9 in the field of vision in Group 1 and 2, respectively. Combined leukocyturia and microhematuria in the general urine analyses were detected in about a third of the children of the 1 and 2 groups (32.3% and 28.5%, respectively, with the average number of erythrocytes being 10.21±3.52 and 8.66±2.26 in the field of vision. Moderate proteinuria less than 1 g/l was observed in 26,4 % and 21,4 % accordingly thus average parameters of proteinuria were 0,089±0,007 % and 0,056±0,008 %. Transient macrohematuria was registered in 32.3% of children in group I and 10.7% in group II. Biochemical analysis of blood and urine revealed that in 94.1% of cases the level of MCL in children of the 1st group exceeded the standard values, while in 76.4% of children hyperrecemia had average values in the range of 350-400 μmol/l, while in the rest of the patients' contingent the level of MCL was < 400 μmol/l, while in children of the 2nd group the increase of MCL level was revealed in only 2 children (7.1%). Thus, in almost absolute majority of children with chronic pyelonephritis HA was observed against the background of uraturia. At the same time, the average blood MK level of the 1st group significantly exceeded the parameters of the 2nd group (439.45±12.33

November-December 2019
ISSN: 0193-4120 Page No. 1551 - 1554

µmol/l and 297.14±19.55 µmol/l; p<0.001). At the same time, there were differences in terms of sex difference, so boys had a higher blood MMK level - 419.23±55.21 µmol/l, in contrast to girls 374.70±32.14 µmol/l. The urine MKK level was also high compared to normal values. So the average degree of hyperuricose was in the range from 5 to 7 mmol/l.

Combined uratno-oxalate crystalluria was found in 26.5% of children of the 1st group, while in children with primary chronic pyelonephritis, uranium and oxalate salts insignificant amounts were also found in children of the 2nd group (17.8%). In the open urine drop crystallographic study, the most frequently detected were Urates (67.6%) and Sodium Urates (32.3%), mainly large and uric acid crystals (26.5%) of different sizes. In 41.1% of children, protein in the form of a thin rim along the edge was observed. Skeletal dendrites (17.6%), oxalates (17.8%) of different sizes in the preparation, lens-shaped crystals (23.5%), cholesterol (14.7%) were also detected. In a closed drop of urine - lamellar (55.8%), needle (23.5%) crystals, spherolites (29.4%), atypical forms (11.7%). Cystoscopy revealed a significant frequency of cystitis in children in the group with purine metabolism pathology (52.9% and 21.4% in the group with primary chronic pyelonephritis).

According to the data of excretory urography and mix cystography, congenital renal abnormalities were revealed in 8.8% and 3.6% of the examined children of the compared groups; urinary tract neurogenic dysfunction - in 26.5% and 14.2% of children of the 1st and 2nd groups; vesicoureter reflux - in 5.8% and 3.6%. In a similar study conducted in the group of children with chronic pyelonephritis against the background of disturbed purine metabolism, we found that the majority of the studied (52.9%) had a level of diabetes mellitus above 75th percentile, while systolic hypertension was observed in approximately 1/5 children of this group (23.5%). ECG study revealed predominance of ECG changes in Group 1 relative to Group 2 (64.7% and 32.1%, p<0.01). Among the heart rhythm disorders in sick children there were more frequent atrial rhythm or rhythm driver migration (23,5% and 7,1%, p<0,05), sinus bradycardia (11,7% and 3,6%, p<0,05). Changes in the repolarization processes in myocardium were recorded in 35.2% of cases in 1 and 10.7% in 2 groups (p<0.01). Thus disorder of repolarization processes was manifested by flattening (11,7%) and inversion (8,8%) of tooth T. Also common pathological signs on ECG were: left ventricular myocardial hypertrophy (41,1% and 25%), right ventricle hypertrophy (14,7% and 3,6%), incomplete blockage of right leg of Hiss beam (23,5% and 10,7%).

Ultrasound examination of the heart in the main observation group showed a high percentage of dysplastic changes in the form of abnormal LV chords (single upper, middle-top-17.6%, multiple-8.8%%), mitral valve prolapse (23.5%), valve apparatus dysfunction accompanied by mitral (8.8%), tricuspidal (5.8%) regurgitation, which was significantly higher compared to the group of children with chronic primary pyelonephritis. It was found out that the probability of detection of small heart abnormalities in the pathology of purine metabolism in combination with the pathology of PFS increased by 4 times. The analysis of structural-geometric parameters of the left heart chambers revealed a reliable increase in the size of LP in children of the 1st group in comparison with children of the 2nd group (2,5±0,03 and 2,2±0,06, p<0,05). Volumetric parameters of LV (FDV, FSV) tended to increase in children with chronic pyelonephritis with disturbed purine metabolism in comparison with primary chronic pyelonephritis. The results of the correlation analysis established the presence of a direct link between the level of uric acid of blood serum and the size of LV (r=0,509; p<0,05), FDV (r=0,450; p<0,05), FSV (r=0,490; p<0,05) LV, thickness of IVS (r=0,490); p<0.05) and LVBW (r=0.548; p<0.05), LVMM (r=0.540; p<0.05), LVMMI (r=0.578; p<0.05) and LVEF (r=-0.410; p<0.05) suggest the presence of toxic effects of purine metabolites on

November-December 2019
ISSN: 0193-4120 Page No. 1551 - 1554

myocardium with subsequent impairment of heart function.

4. Conclusion

Thus, it was found that the increase in the level of MC significantly affects the development and progression of cardiovascular disease, which was expressed in a higher blood pressure level, and the diagnosis of cases of essential arterial hypertension in the group of children with chronic pyelonephritis and violation of purine metabolism. Also in children with chronic pyelonephritis and purine metabolism disorders there is a statistically higher frequency of pathological changes on ECG, as well as EchoCG, which is expressed in a higher reliable frequency of cases of rhythmic and conduction disorders and left ventricular hypertrophy. A significant correlation with the level of uric acid and the degree of violations of EchoKG parameters in children with chronic pyelonephritis against the background of disturbed purine metabolism was revealed.

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