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Hemodynamic Disorders in the Eye Vessels and Their Correction in Children with Chronic Glomerulonephritis

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Abstract There were examined 59 sick children with chronic glomerulonephritis (CGN). All patients underwent ultrasound dopplerography of eye and kidney vessels. Hemodynamic disorders in the form of reduced blood flow rates and resistance of blood vessels were found in 94.9% of the patients. Standard therapy (ST) of CGN in children does not lead to normalization of hemodynamic disorders. Inclusion of chophytol preparation in ST CGN in 93% of cases promotes normalization of blood circulation disorders in the eyes and kidneys.

Keywords Doppler, Eyes, Kidneys, Chronic glomerulonephritis, Chophytol

1. Introduction

Kidney disease in children is a pressing problem of pediatrics. Chronic glomerulonephritis (CGN) often leads to the development of chronic renal failure. [4,5]. Distinguish from mechanisms of progressing of CGN immune (the damages of nefron induced immune) and not immune (haemo dynamic, connected with the system and glomerular hypertensia, metabolic, caused by the violation of fatty exchange [2,4,6]. It is known that the rate of progression of chronic kidney diseases is also influenced by proteinuria [3,7]. It has been established that increased passage of protein through tangles exacerbates glomerulosclerosis, leads to disorders of hemodynamics, tubulointerstitial sclerosis due to damage of proximal canals in case of increased protein reabsorption. Cytokines stimulating inflammation in kidney tubulointersion followed by sclerosis are released [3,12]. Often in such patients, the functions of various organs, including organs of vision, are impaired [1,14].

There are known methods of pathogenetic therapy which promote stopping and slowing down, reverse the development of processes in kidneys, eyes and other organs. Glucocorticosteroids, cytostatics, antiaggregants, hypotensive and hypolipidemic drugs [5,7,11,13] are among such means. In recent years there have been clinical studies in cardiology, gastroenterology, neonatology, nephrology about the positive effect of chophytol on hemodynamics, protein and nitrogen metabolism [10].

However, the works devoted to studying of chophytol preparation influence on the hemodynamics of eye vessels in children with CGN have not been found in the literature available to us, which was the basis for the current research.

The work aimed to estimate the influence of chophytol preparation on eye vessel hemodynamics in children with chronic glomerulonephritis.

2. Research Materials and Methods

59 children with chronic nephrotic glomerulonephritis who were undergoing inpatient treatment at the 1st clinic of the Tashkent Medical Academy were examined, 37 (62.7%) of boys and 22 (37.3%) of girls aged 7-14 years. The duration of the disease was 1-3 years in 23 children, 4-5 years in 24.5 years and more in 12 years. The diagnosis was based on anamnesis and the results of clinical and laboratory tests. The classification adopted at the International Symposium of Pediatricians and Petrologists (Vinnitsa, 1976) was used for diagnostics.

All patients were studied generally accepted in nephrological practice: general urine analysis, Zimnitsky's and Reberg's samples, measurement of daily diuresis, blood pressure, biochemical studies (urea, creatinine, total protein and its fraction), kidney ultrasound; functional state of the kidneys was assessed by the level of residual nitrogen in the blood serum, the rate of ball filtration, concentration ability of kidneys, proteinuria. The state of blood circulation of both eyes was determined by ultrasound Doppler ultrasound on PHILIPS HD 11X. Maximal systolic speed (Vmax) and final diastolic speed (Vmin), resistance index (Ri) were studied. Biomicroscopy of the anterior and posterior eye regions was performed on Karl Zeis. Visual acuity was determined using

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Snellen tables, eye bottom condition was determined by ophthalmoscopy. Patients were divided into two groups - with chronic glomerulonephritis with preserved kidney function (CGNPKF) and disturbed kidney function (CGNDKF). The group of patients with CGNDKF included children with oliguria, proteinuria, high content of urea and creatinine, decreased rate of ball filtration.

29 sick children received standard therapy (CT) of CGN (glucocorticosteroids, curantils, heparin, diuretics, cytostatics and symptomatic agents), 30 patients received chophytol (CT + chophytol) along with standard therapy.

3. Results and Discussion

The study of hemodynamics parameters in ocular vessels showed that in 56 (94,9%) patients with chronic glomerulonephritis a decrease of Vmax and Vmin was established at the level of ocular artery (OA), central retinal artery (CRA) and posterior short ciliary artery (PSCA) ($P<0,05$) before treatment with simultaneous increase of Pi($P<0,05$). Violations of blood flow velocities and vascular resistance were more pronounced in the group of patients with CGNDKF ($P<0,05$), which seems to be associated with a significant number of patients with CGN with more than 5 years of experience in this group (Table 1). This indicates a significant complication of the blood flow in the blood vessels of the eye and explains the vascular side of the pathogenesis of changes in the structures of the eye bottom. The obtained results are consistent with the research data on the development of retinopathy, nephropathy, cardiopathy, and lesion of brain vessels exactly from the periphery, in the course of microcirculation [5].

Studies of visual organ function showed that visual acuity in 45 (76.3%) patients was 1.0 in 10 (16.9%) - 0.8-0.9, in 4 (6.8%) - 0.5-0.7. The transparent lens was observed in 43 (72.9%) patients, opacity in the posterior capsule - in 9 (15.2%), nucleus opacity - in 7 (11.9%). The vitreous body was without pathology in 53 (89.8%) patients, its partial detachment was observed in 6 (10.2%), chorioidea edema - in 11 (18.6%). Visual nerve discs (VND) were without pathology in 18 (30,5%) children, VND decolorations - in 5 (86,4%), VND borders were without pathology in 16 (27,1%) patients. Peripapillary oedema was detected in 12 (20.3 per cent), arterial constriction - 51 (86.4 per cent), vein contraction - 45 (76.3 per cent), point hemorrhages in the course of vessels - in 4 (6.8 per cent), presence of yellowish-coloured spectacles - in 9 (15.3 per cent) children. Violations of visual organ function were more often detected in hemodynamic disorders in eye vessels and were more pronounced in patients with CGNDKF.

Thus, before treatment in children with CHGN, ambiguous changes in blood flow in eye vessels are observed, with a decrease in blood flow rates in eye vessels (GA, CRA, PSCA), the resistance of vessels increases, especially in patients with CGNDKF, which, leads to visual impairment.

One of the main pathogenetic links in the development of chronic complications of CGN is hyperuricemia and its associated metabolic disorders [5]. The mechanism of damaging action on kidney structural components is associated primarily with renal hemodynamics disorders, namely, development of hyperfiltration and intracellular hypertension. The development of edema, necrosis with the following renal fibrosis interrupts the natural line of arterial blood flow from the renal artery through segmental, interstitial and arc branches [3].

Table 1. Conditions of blood flow in eye vessels in children with CHGN before and after treatment (M ±m)

	Indicators	Control group	Before treatment (n=45, n_2=14)	After treatment	
				CT(n=23, n_2=6)	CT+ chophytol (n=22n_2=8)
OC	$V_{max\ sm/s}$	40,6 ±1,6	$\frac{32,6 \pm 1,8^{a}}{29,6 \pm 1,3^{a}}$	$\frac{36,2 \pm 1,2^{a}}{33,5 \pm 1,5^{a}}$	$\frac{39,7 \pm 1.4^{b}}{38,9 \pm 1.5^{b,c}}$
	$V_{min\ sm/s}$	11,3 ±0,7	$\frac{6,2 \pm 0,6^{a}}{5,5 \pm 0,9^{a}}$	$\frac{8,1 \pm 0,7^{a}}{7,5 \pm 0,6^{a}}$	$\frac{11,2 \pm 0,9^{b,c}}{10,7 \pm 0,6^{b,c}}$
	RI	0,68 ±0,02	$\frac{0,81 \pm 0,02^{a}}{0,85 \pm 0,03^{a}}$	$\frac{0,78 \pm 0,03^{a}}{0,79 \pm 0,02^{a}}$	$\frac{0,66 \pm 0,03^{b,c}}{0,65 \pm 0,02^{b,c}}$
CRA	$V_{max\ sm/s}$	16,1 ±1,1	$\frac{8,3 \pm 0,7^{a}}{6,1 \pm 0,4^{a}}$	$\frac{13,1 \pm 0,6^{a}}{12,0 \pm 0.5^{a}}$	$\frac{16,3 \pm 0,8^{b,c}}{15,8 \pm 0,6^{b,c}}$
	$V_{min\ sm/s}$	5,00 ±0,05	$\frac{4,5 \pm 0,1^{a}}{3,9 \pm 0,1^{a}}$	$\frac{4,70 \pm 0,08^{a}}{4,20 \pm 0,07^{a}}$	$\frac{5,10 \pm 0,08^{b,c}}{4,9 \pm 0,1^{b,c}}$
	RI	0,64 ±0,03	$\frac{0,73 \pm 0,03^{a}}{0,80 \pm 0,02^{a}}$	$\frac{0,69 \pm 0,03^{a}}{0,73 \pm 0,03^{a}}$	$\frac{0,63 \pm 0,04^{b,c}}{0,62 \pm 0,03^{b,c}}$
PSCA	$V_{max\ sm/s}$	15,3 ±0,8	$\frac{11,3 \pm 0,5^{a}}{9.8 \pm 0.6^{a}}$	$\frac{12,2 \pm 0,4^{a}}{11,1 \pm 0,5^{a}}$	$\frac{14,9 \pm 0,7^{b,c}}{14,5 \pm 0,6^{b,c}}$
	$V_{min\ sm/s}$	6,20 ±0,04	$\frac{4,5 \pm 0,3^{a}}{4,0 \pm 0,2^{a}}$	$\frac{4,9 \pm 0,4^{a}}{4,4 \pm 0,3^{a}}$	$\frac{6,00 \pm 0,03^{b,c}}{5,90 \pm 0,04^{b,c}}$
	RI	0,56 ±0,03	$\frac{0,67 \pm 0,04^{a}}{0,69 \pm 0,05^{a}}$	$\frac{0,62 \pm 0,05^{a}}{0,65 \pm 0,04^{a}}$	$\frac{0,56 \pm 0,04^{b}}{5,58 \pm 0,05^{b}}$

Note: in numerator - indices in patients with preserved kidney function; in denominator - in patients with disturbed kidney function; [a] - reliability of differences in comparison with control; [b] - reliability of differences in comparison with the initial one before treatment; [c] - reliability of differences in groups of patients who received and did not receive chophytol.

Changes in the characteristics of the ocular and renal blood flow are often ahead of the clinical manifestation of the disease, and, consequently, monitoring of the ocular hemodynamics parameters allows to reveal tendencies of the process development at the early stages of the disease; it is possible to predict its course and development of complications [6]. Since the most pronounced disorders of ocular hemodynamics have been registered in patients with impaired renal function with a long course of the disease, it testifies to the generalized nature and severity of microvascular channel injuries in CGN in children.

The study of hemodynamic parameters during treatment in groups with CGNPKF and CGNDKF showed high efficacy of chophytol. Thus, if the V_{max}, V_{min}, Pi parameters of eye vessels in the group of patients undergoing standard therapy do not normalize or tend to normalize, then in the group of children undergoing chophytol the disturbed hemodynamic parameters will normalize by the end of treatment ($P < 0.05$). At the same time, in the same patients with visual acuity, visual functions are restored.

Under the action of chophytol hemodynamics of eye, vessels is normalized, filtration of ball-shaped eyes, the level of total serum protein increases, the content of urea and creatinine decreases, creatinine excretion with urine increases, diuresis increases [2]. The mechanism of action of the drug is associated with the cellular-protective activity of the drug, due to the normalization of the antioxidant system [10].

Thus, CGN in children is accompanied by hemodynamic disorders in eye vessels, visual acuity, more pronounced in children with impaired renal function. Chophytol application in complex treatment of children with CGN helps to normalize blood flow in eye vessels and improve visual acuity.

REFERENCE

[1] Averchenko M.V. Method of diagnostics of nephroangiopathy Ultrasonic diagnostics in pediatrics. 2007. №4. p.203.

[2] Averchenko M.V., Klimova E.E., Fedotov I.G. Ultrasound investigation of renal blood flow in children with congenital and acquired kidney diseases. Collection of abstracts of the First Far Eastern Congress of Ultrasonic Diagnostics Specialists in Khabarovsk. 2005. p.105.

[3] Artamonova A.V., Katargina L.A., Kogoleva L.V., Kruzhkova G.V. Comparative analysis of linear blood flow velocity in the central artery of the retina and the orbital artery in children with various stages of retinopathy of premature infants IV All-Russian Scientific Conference of Young Scientists, Actual problems in ophthalmology: thesis Docl. M 2009. p.91.

[4] Bekezin V.V., Kozlova E.Yu. Modern possibilities of ultrasonic diagnostics of kidney condition in children. Journal of Modern Technologies in Medicine 2017.T9 № 2 p.170.

[5] Borsoukov A.V., Bekezin V.V. Standardization of qualitative evaluation of kidney dopplerography in children with obesity and metabolic syndrome. Vestnik of Smolensk State Medical Academy 2015.T14 ¹2 p.34.

[6] Bobkova I.N. Cellular-molecular mechanism of nephrotic action of proteinuria: role in the progression of chronic glomerulonephritis, ways of influence of autoref. Doctor of medical sciences. 2007.

[7] Vinokhodova I.N., Landyshev Yu.S. Ultrasonic estimation of the renal blood flow changes in bronchial asthma patients. Ultrasonic diagnostics. № 3.2008. p.111.

[8] Dashyan G.L. Abdusharipov M.A. Ultrasound investigation in diagnostics of the causes of hematuria. Journal of Young Scientist. 2015. №15. p.273.

[9] Ignatova M.S., Dlin V.V. Nephrotic syndrome: Past, Present and Future. Russian Journal of Pernatology and Pediatrics, 2017 p.29.62 (6).

[10] Konratieva O.D. Ultrasound investigation of intrahepatic blood flow in patients with oxalate nephropathy under conditions of functional load sample. Ultrasound diagnostics. 2008. №3. p.11.

[11] Katkova E.A. Diagnostic ultrasound. Ophthalmology / Practical Manual under the editorship of F.V. Zubarev 2002. P.120.

[12] Kiseleva T.N. Color Doppler Mapping in Ophthalmology // Ophthalmology Newsletter 2001 №6, pp.50-52.

[13] Safronova L.E. Clinical and functional, hemodynamic and morphological aspects in glomerulonephritis in children VIII Scientific Society of Nephrologists of Russia; a collection of theses Moscow 19-22 October 2010 Ñ41.

[14] Tsykunov K.A. Ultrasonic diagnostics of kidney parenchyma lesions in children with bladder-urea reflux. Journal of Science and Health, 2014, № 1. p.85.