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THE ROLE OF COMPLEX ULTRASOUND IN THE CLINICAL DIAGNOSIS OF NEPHROANGIOPATHY IN TYPE 2 LATENT DIABETES

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Abstract:
Unfortunately, as in many countries of the world, the diagnosis and prevention of DN go with a certain delay, which leads to irreversible consequences. The detection of DN at the initial stage has a decisive prognostic value for the patient, since this stage is potentially reversible. In this regard, it becomes relevant to search for methods that allow diagnosing diabetic nephropathy at an early stage. A promising direction in solving this problem is the use of a comprehensive echographic examination of the kidneys, which includes an assessment of intra-organ hemodynamics.

Keywords: arterial hypertension, diabetic nephropathy, microalbuminuria, diabetes mellitus, glomerular filtration rate, ultrasound examination, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, color Doppler mapping, energy Dopplerography**.**

Introduction

Diabetic nephropathy is a specific kidney lesion in DM, which is accompanied by the formation of diffuse (in the early stages) and nodular (in the late stages) glomerulosclerosis, leading to the development of CRF.

Diabetic nephropathy is a life-threatening, constantly progressive complication of diabetes, which is characterized by significant structural rearrangements of the kidney: thickening of the glomerular basement membrane, glomerular hypertrophy, sclerosis, expansion of mesangial cells, tubulointerstitial fibrosis and inflammation.

The problem of diabetic nephropathy (DN) appeared at the beginning of the twentieth century, acquired dramatic proportions by the end of this century and at the maximum peak of prevalence crossed into the XX1 century. During the last decade, in the USA and a number of countries in Europe and Asia, DN has reached the 1st place in terms of the need for replacement therapies for renal insufficiency (dialysis or

kidney transplantation), displacing primary renal diseases of other etiology to the 2nd-3rd place.

A feature of kidney damage in type 2 diabetes is the absence of pronounced clinical symptoms at the beginning, which is the reason for its late diagnosis and complicates the study of the dynamics of the pathological process. It is difficult to trace the changeability of the stages of DN and time intervals in type 2 diabetes with age due to the multi-morbidity of the pathology.

Kidney damage in diabetes was indicated as early as 1770 by Cotugnius, who described proteinuria in diabetic patients. In 1936, P.Kimmelstiel and S. Wilson pointed out that patients with diabetes do not develop kidney damage, accompanied by edema, massive proteinuria and hypertension. Based on the revealed morphological changes, this kidney lesion was called intercapillary glomerulosclerosis. According to the authors, the revealed degenerative changes in the kidneys are the result of metabolic disorders. In the future, kidney damage in DM was called diabetic nephropathy. DN is equally common in type 1 and type 2 diabetes mellitus. According to different authors, DN is detected on average in 1/2 - 1/3 patients with type 1 and type 2 diabetes. There is data on the significance of ethnicity in the occurrence and severity of DN. According to some authors, pathology is more common in people of Asian and Mexican-American origin.

In European countries, for example in Denmark and Poland, DN b occurs in 23-25% of patients with type 2 diabetes, while in Japan in 60% of patients. Throughout the world, DN and the resulting CRF are the leading cause of mortality in patients with DM 1. In patients with DM 2, DN is on the 2nd place among the causes of death after cardiovascular diseases. According to the prevalence of DN, the USA, Japan, and Germany are leading.

Screening of diabetic nephropathy in 20 regions of the Russian Federation revealed that the prevalence of this complication varies in different regions, the current incidence of DN was 40% (20-50%), which is consistent with the data* of the world literature. Preclinical stages in the development of DN are characterized by functional and structural changes in the kidneys in the absence of typical signs of renal pathology. These stages include the stage of hyperfiltration (an increase in GFR over the age norm) and the stages of initial structural changes in kidney tissue (thickening of the glomerular basement membranes, expansion of the mesangial matrix). These changes can be detected in the first 5 years from the onset of DM, however, in real clinical practice, such early and, as a rule, reversible disorders are not significant for the diagnosis of DN. The clinical stages of the development of DN include the stage of

incipient DN (characterized by the appearance of MAU), the stage of pronounced DN (corresponds to the appearance of NU) and the stage of CRF.

The main advantage of this classification is its focus on identifying the early stages of DN. According to this classification, proteinuria manifests itself only at stage IV of DN. The first three stages are asymptomatic and clinically do not manifest themselves in any way, and, what is very important, only these stages can be reversible. The appearance of proteinuria indicates that about 50-75% of the glomeruli are already sclerosed, and the process in the kidneys is irreversible.

At the same time, taking into account the adoption of the new classification of CKD proposed by the National Kidney Foundation of the USA in 2002, it is now necessary to correct the formulation of the diagnosis of DN indicating the stage of CKD, since patients with different levels of GFR can belong to the stages of MAU and PU. In addition, it is not uncommon to meet patients with DM and reduced GFR without MAU, PU and other laboratory signs of kidney damage, however, a low level of GFR requires special attention in such persons and its reflection in the diagnosis.

The MAU stage is crucial in the fate of a DM patient, since it is completely reversible with the timely appointment of pathogenetic therapy. With DM2, it can be detected at the first visit of the patient to the doctor. During long-term follow-up of a group of patients with MAU, it was indicative that increased urinary albumin excretion was associated with a 20-fold increase in the risk of progression of kidney damage to the PU stage. In healthy individuals, urinary albumin excretion ranges from 1.5-20 mcg/min. (or up to 30 mg/day.), averaging 6.5 mcg/min. Daily fluctuations in albumin excretion rates in both healthy individuals and patients with diabetes account for about 40%. In this regard, to identify the true MAU, confirmations are required in 2 out of 3 urine tests repeated at intervals of 3-6 weeks in the absence of urinary infection.

Purpose of the study

Detection and early diagnosis of vascular disorders in patients with type 2 diabetes without clinical signs of renal artery stroke using bilateral scanning.

Material and research methods

To solve the tasks on the basis of the GUZ "Republican Clinical Hospital" of the Ministry of Health of the Republic of Tatarstan, the results of the examination of 182 patients were analyzed. Of these, 115 patients with type 2 diabetes and 67 with hypertension. The main group consisted of 115 patients with type 2 diabetes, which

included 58 (50.4%) patients with normoalbuminuria and 57 (49.6%) patients with microalbuminuria.

Of 58 patients with normoalbuminuria, 19 (32.8%) men and 39 (67.2%) women, aged 38 to 73 years, mean age 53.9± 1.3 years. Of 57 patients with microalbuminuria, 19 (33.3%) men and 28 (66.7%) women, aged 36 to 75 years, mean age 54.7± 1.4 years. The average duration of type 2 diabetes was 6.9±0.5 years. The criteria for inclusion in the group were the absence of kidney disease, arterial hypertension and renal artery stenosis.

Treatment for patients: diet therapy - 28, tablet therapy - 48, insulin therapy - 39. The diagnosis of type 2 diabetes in patients was made based on the analysis of the data obtained during the collection of anamnesis, clinical and laboratory studies. Patients with arterial hypertension, severe atherosclerosis of the terminal aorta, renal artery stenosis, nephroptosis, chronic pyelonephritis, glomerulonephritis, urolithiasis, diabetic nephropathy in the proteinuria stage were excluded from the group of patients with type 2 diabetes.

The comparison group is represented by 67 patients with hypertension, 35 (52.2%) men and 32 (47.8%) women, aged 30 to 67 years, whose average age was 52.5 ± 1.5 years. The group of patients with hypertension did not include patients with kidney diseases, symptomatic hypertension and impaired carbohydrate metabolism. The duration of the course of arterial hypertension is from 3 to 15 years, on average, the duration of the disease is 7.1 ± 0.7 years. The diagnosis of hypertension was verified in accordance with the Russian Guidelines for the diagnosis and treatment of arterial hypertension in 2008. The criteria for the diagnosis of hypertension were blood pressure 140/90 mmHg and more. Among 67 patients with arterial hypertension, the blood pressure level ranged from 140/90 mmHg to 165/105 mmHg.

Research results and their discussion

The following standards of kidney echography were applied: kidney position (normal, displaced), dimensions (length, width, thickness), contours (smooth, clear, uneven), shape, echogenicity of parenchyma, thickness of parenchyma, condition of the calyx-pelvic system, renal blood flow (tissue, renal, main and segmental arteries) with assessment qualitative and quantitative characteristics.

The study of the main renal vessels was carried out in order to exclude their pathologies (stenosis, anomalies, etc.). With ultrasound examination with blood flow CCC, ED, ZD, tissue renal blood flow in the kidneys was studied in patients of this group. The resistivity index and the pulsation index in the group of patients with type 2 diabetes with normoalbuminuria were also statistically significantly higher

(0,71±0,001, 1,39±0,004), than those of the control group (0,63±0,01, 1,21±0,05) (p<0.05). The data obtained indicate that intrarenal vascular resistance in patients with type 2 DM with normoalbuminuria is higher than in the control group.

Analysis of indicators characterizing the functional state of the kidneys in patients with type 2 diabetes with normoalbuminuria revealed: daily diuresis was equal to 1595.0 ±41.0 ml, daily diuresis was 899.0±43.0 ml, night diuresis was 748.0±37.0 ml (p<0.05).

The presence of glucose in the urine was detected in 39.9% of patients. The average urinary albumin excretion in patients of this group was 8.5±0.6 ml/l (p<0.05). The average value of creatinine in serum in the examined group was 86.5±15.3 mmol/l, in urine 7.9±0.5 mmol/l (p<0.05).

The average value of the glomerular filtration rate in the group of patients with type 2 diabetes with normoalbuminuria was 167.1±9.3 blood flow in the kidneys in patients of this group. The resistivity index and the pulsation index in the group of patients with type 2 diabetes with normoalbuminuria were also statistically significantly higher (0,71±0,001, 1,39±0,004), than those of the control group (0,63±0,01, 1,21±0,05) (p<0.05). The data obtained indicate that intrarenal vascular resistance in patients with type 2 DM with normoalbuminuria is higher than in the control group.

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When analyzing the hemodynamic parameters of intrarenal blood flow, the relationship of the maximum blood flow rate with the body surface area (g= 0.30, p= 0.02), the minimum blood flow rate with age (g=0.39, p=0.03), the level of systolic blood pressure (g=0.31, p=0.03) was established. The average blood flow rate was directly related to fasting glucose level (g=0.38, p=0.02) and inversely related to age (g=-0.38, p=0.06) and body surface area (g=0.30, p=0.04).

A direct correlation was found between the resistivity index in patients of this group with the age of patients (g=0.46, p=0.05) and the level of systolic blood pressure (g=0.38, p=0.004), and the pulsation index with age (g=0.35, p=0.01), and an inverse relationship with the level of HDL in blood serum (r=-0.35, p=0.03).

The glomerular filtration rate was directly related to the male sex (g=0.30, p=0.009), systolic blood pressure (g=0.49, p=0.002), fasting blood glucose (g=0.50, p=0.002). The indicator of creatinine level in blood serum was directly related to the male sex (g=0.36, p=0.004), body weight (g=0.20, p=0.04) and body surface area (g=0.20, p=0.03). The dependence of the level of albumin in urine with the indicator of triglycerides in blood serum (g = 0.20, p = 0.05) was established. Thus, in the group of patients with type 2 diabetes with normoalbuminuria, the total volume of the kidneys was associated with anthropometric indicators, with carbohydrate and lipid metabolism. Linear hemodynamic parameters of intrarenal blood flow directly correlated with anthropometric parameters, the level of systolic blood pressure and carbohydrate metabolism. The resistivity index was directly related to age, the level of systolic blood pressure, and the pulsation index with age. It was found that the blood flow in the kidneys in patients with type 2 DM with normoalbuminuria is enhanced, and intrarenal vascular resistance is increased in comparison with those in the control group.

Based on the data obtained for patients with type 2 diabetes with normoalbuminuria, early signs of kidney damage are an increase in hemodynamic parameters of intrarenal blood flow and the index of intrarenal vascular resistance in combination with increased GFR.

Conclusions

1. Comparative evaluation of echographic criteria of diabetic nephropathy and kidney damage in patients with arterial hypertension revealed a more significant increase in kidney volume (249.7±4.7 cm x 1.73 m) $p<0.05$, increased intrarenal blood flow ($p<0.05$) and an increase in the index of intrarenal vascular resistance (0.71±0.01) $p<0.05$ in patients with diabetes mellitus 2 types.
2. The proposed algorithm of examination of patients with type 2 diabetes mellitus using complex echography with Doppler techniques in combination with laboratory research methods allows diagnosing the early stages of diabetic nephropathy and differential diagnosis with nonspecific kidney lesions.

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