

## IMPORTANCE OF COMPLEX ULTRASOUND EXAMINATION IN THE CLINICAL DIAGNOSIS OF NEPHROANGIOPATHIES IN ASYMPTOMATIC TYPE 2 DIABETES

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### Abstract:

Thanks to intensive research in the 90s, the structure of risk factors associated with the development and progression of DN was determined in sufficient detail. The main risk factors include hereditary predisposition, arterial hypertension (AH), and the quality of metabolic control. The occurrence and rate of progression of DN can also vary significantly depending on the level of proteinuria, gender, age, duration of DM, comorbid pathology, body mass index (BMI), treatment and some other 6 clinical factors. However, the search for other predictors of an unfavorable course of DN, in addition to the already known ones, continues intensively. Thus, morphological changes in kidney tissue, which are associated with hyperplastic processes, excessive accumulation of the matrix, with an increase in the volume of the glomerulus and interstitium, and, subsequently, with the development of diffuse nephrosclerosis, are of no small importance in the prognosis of the course of DN and the effect of therapy.

**Keywords:** insulin-dependent diabetes mellitus, parenchymal index, high-density lipoproteins, low-density lipoproteins, microalbuminuria, medulo-parenchymal index, normalbuminuria, nephrotic syndrome, kidney volume, total cholesterol.

### Introduction

In earlier studies, according to ultrasound and X-ray examination of the kidneys, in groups of patients with newly diagnosed ISD, an increase in kidney size up to 20% was shown, along with an increase in plasma flow and GFR. These changes in many patients were reversible after 3 months of adequate insulin therapy. The transient nature of the increase in OP obviously indicates that factors associated with hyperglycemic status play a role in its genesis:

increased blood flow and edema of renal tissue against the background of osmotic imbalance. Indirectly, these assumptions are confirmed by data from the late 80s, when the situation with early diagnosis and high-quality insulin therapy was solved. So, Banholzer R. and co-authors have not found any tendency to increase OP or parenchyma in individuals with a duration of

DM up to 6 months (Banholzer P. et al., 1988). However, some patients have an increase in GFR persists despite fairly satisfactory metabolic control. The next stage of DN is the stage of initial structural changes (2), which is also practically asymptomatic, but during this period there is a transition to the formation of structural (thickening of the glomerular basement membrane) and functional changes in the renal tissue, i.e. the development of DN per se. After 3-5 years from the onset of DM,

morphologically, against the background of thickening of the glomerular basement membrane (GBM), a slight increase in the volume of the mesangium is also determined. The fractional volume of the mesangium and the thickening of the GBM are found not only in patients with ISD with microalbuminuria (MAU) or proteinuria, but also in normalalbuminuric patients, although in the latter the severity of these morphological changes is less. At this stage, Caramori M.L. and co-authors noted a significant correlation of mesangium volume with both the severity of albuminuria and GFR. In addition, patients belonging to the upper quartile in terms of the severity of the increase in mesangium volume had significantly poorer metabolic control, more pronounced hypertension and retinopathy (RP), as well as, naturally, more pronounced sclerotic changes in the glomeruli.

With the development of this stage of DN, sonographic OP significantly increased (on average, by 19%). At the same time, a 15% increase in the parenchymal index (PI) was noted, which can be considered as a reflection of the beginning hypertrophic and hyperplastic changes in kidney tissue. It is fundamentally important that the development of morphological changes in the renal tissue in the early stages of DN significantly outstrips the symptoms, the first stage of DN, which can be quite accurately determined clinically, is the so-called microalbuminuric stage (3). This term reflects the fact that, despite the presence of already distinct changes in the renal parenchyma, routine urine tests they remain "calm" - without obvious proteinuria and deviations in the urinary sediment.

The diagnosis of DN at this stage can be established clinically by the presence of MAU from 20 to 200 mcg/min (30-300 mg/day). In addition, in some patients, with regular measurement of blood pressure (BP), hypertension can be recorded, and in the study of GFR, its increase. The appearance of this stage is of extremely important clinical significance, because, firstly, changes in renal tissue during this period are still potentially reversible with timely diagnosis and therapy; secondly, MAU is clearly associated with an increased risk of death in DM patients.

**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.** The clinical part of the study, devoted to the analysis of the natural course of DN and the determination of factors associated with the progression of the disease, included 180 patients with diabetes mellitus, of which 77 people with ISD, 103 people with INSD (the main group), as well as 41 patients with chronic glomerulonephritis without NS and 40 healthy volunteers who made up control groups (I and II).

**Research results and their discussion.** A number of features of the influence of linear dimensions on OP were noted in patients with DN on the background of ISSD and INZSD. Thus, in patients with DN against the background of ISD, both the thickness of the renal parenchyma and the thickness of its cortical layer and the size of the pyramids directly and reliably affect OP.

According to these data, it seems that the increase in OP with ISD occurs both due to an increase in the volume of cortical and cerebral matter, and with INZSD, it is the cortical substance that mainly affects the total value of OP for an adequate comparison of sonographic parameters associated with structural changes in renal tissue, 2 groups of patients were analyzed, consisting of patients with ISSD and INZSD. These groups were identical in clinical indicators reflecting the severity of CKD -proteinuria, the

duration of diabetes, and indicators of the functional state of the kidneys. Patients with DN on the background of INZSD had only significantly higher figures of average blood pressure. In these groups, a distinct tendency to more pronounced changes in the pyramids, coarser changes in the echogenicity of the parenchyma, and a greater total thickness of the parenchyma were noted for DN with ISSD. At the same time, the OP, and the thickness of the cortical layer of the parenchyma did not differ with ISSD and INZSD. In patients with DN, lower values of PI and greater thickness of the renal sinus were noted against the background of INZSD. It could be assumed that this increase is associated with a large volume of adipose tissue of the sinus against the background of overweight in most patients with INSD. However, there was no correlation between BMI and PI ( $r= 0.025$ ,  $p= 0.788$ ). In this regard, the most likely explanation for the decrease in PI in insulin-dependent patients (with the same thickness of the parenchyma in comparison with ISD) are more pronounced sclerotic changes in the interstitium of the medulla against the background of a long course of hypertension and vascular changes characteristic of this type of diabetes, which is confirmed by a reliable direct relationship between the size of the renal sinus and the values of SAD ( $g=0.304$ ;  $p<0.0001$ ), DAD ( $g=0.205$ ;  $p=0.004$ ), ADsr ( $g=0.276$ ;  $p<0.0001$ ). The development of DN is characterized by a steady tendency to the development of kidney dysfunction. Therefore, to study the dynamics of sonographic indicators during the evolution of DN, patients were divided into 3 groups depending on the functional state of the kidneys. Group 1 included patients with GFR 60-89 ml/min, which corresponded to stage II of CKD; group 2 consisted of people with GFR from 59 to 30 ml/min (stage III of CKD); patients with GFR <30 ml/min were included in group 3 (IV-V stages of CKD).

In the general group of patients with DN, which included patients with both types of DM, there was a distinct tendency to increase the size of the pyramids and increase the echogenicity of the parenchyma with the progression of renal pathology, as well as a decrease in the thickness of the cortical layer of the parenchyma.

OP increased in patients of group 2 compared to group 1, but with the development of more pronounced renal dysfunction decreased, obviously due to gross sclerotic changes in the organ (group 3, IV-V stages of CKD). At the same time, no reliable dynamics of MPI, PI, and the thickness of the renal parenchyma were detected.

In the separate analysis of patients with DN and different types of DM, the presented patterns of dynamics of sonographic parameters were preserved in the separate analysis of groups of patients with DN against the background of different types of DM.

Thus, it was found that the tendency to increase OP and the development of renomegaly is a characteristic feature of DN, which distinguishes this pathology from other glomerular diseases (CGN). The increase in OP is mainly determined by the thickness of the renal parenchyma in both types of DM. However, in patients with DN against the background of ISD, an increase in the pyramids (brain matter) makes a more significant contribution to the development of renomegaly.

The increase in OP in comparison with the control groups is noted already at relatively early stages of DN corresponding to stage II of CKD, and continues to progress, despite the development of deeper renal dysfunction, and in stage III of CKD (GFR 30-59 ml/min). A slight decrease in OP occurs only with the development of severe renal dysfunction of stage IV-V of CKD (GFR <30 ml/min). The total thickness of the parenchyma remains stable, as well as MPI and PI. However, there is clearly an increase in the size of the pyramids and a progressive decrease in the thickness of the cortical layer of the parenchyma.

## Conclusions

A progressive increase in kidney volume in patients with diabetic nephropathy persists until the development of IV-V st. chronic kidney disease (with glomerular filtration rate < 30 ml / min), in the future, kidney volume tends to decrease against the background of progressive sclerotic changes in parenchyma.

Changes in pyramids, thickness and echogenicity of parenchyma, as well as kidney volume in patients with diabetic nephropathy with both types of diabetes mellitus have a direct and reliable relationship with the amount of daily protein excretion in urine.

The development of renomegaly and an increase in the size of the kidney pyramids, along with the severity of proteinuria, hypertension and the age of patients, are predictors of a faster progression of diabetic nephropathy.

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