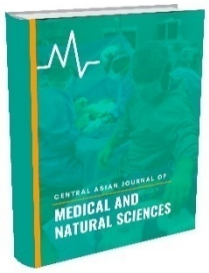
CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES



Volume: 02 Issue: 04 | Jul-Aug 2021 ISSN:2660-4159

http://cajmns.centralasianstudies.org

Modern Methods for Diagnosing Disorders of Kidney Function (Literature Review)

1. **Mukhamedova N. Kh.**
2. **Shukurova U. P.**

Received 24th May 2021,
Accepted 25th June 2021,
Online 23th Aug 2021

[1]Tashkent Medical Academy

ABSTRACT: In modern urological practice, various modern research methods, the latest devices and instruments are used to diagnose diseases of the genitourinary system. The introduction of highly informative methods of radiation diagnostics: ultrasound scanning, computed and magnetic resonance imaging - allows detecting kidney diseases at an early stage.

Keyword: Diagnosing, Kidney Function, blood test, diseases.

Laboratory diagnostics necessarily include a general blood test to identify signs of a possible infectious process in the body, to determine the amount of hemoglobin, a decrease in which is possible with kidney disease [1,2,3,4].

A biochemical blood test shows the content of various substances, including uric acid and creatinine (nitrogenous toxins), an increase in which indicates insufficient kidney function. In severe renal failure, the amount of urea and creatinine in the blood can increase by 5-10 times. A biochemical blood test can also be used to judge about other changes in the body that may be related to the urinary system. One of the most accurate studies of renal function is the determination of creatinine clearance according to the formula, the volume of blood that is cleared of creatinine in one minute is calculated. This indicator allows you to more accurately determine the degree of renal failure [3].

Modern protocols for the treatment of glomerulonephritis based on the data of percutaneous puncture biopsy of the kidney.

Percutaneous kidney biopsy examines the kidney tissue. Under the control of ultrasound, a fine biopsy needle is taken through the skin of the kidney tissue microelements under anesthesia. Then these elements are examined by a morphologist in three ways: light, immunofluorescence and electron microscopy, on the basis of which a conclusion about the type of kidney pathology is issued. Kidney biopsy became routine nephrological practice in the late 20th century and radically changed the diagnosis of kidney disease. It is currently impossible to establish a reliable diagnosis without renal biopsy studies.

The study of creatinine is widely used in laboratory practice, firstly, as one of the biochemical indicators of hyperazotemia; secondly, as a clearance indicator characterizing the degree of purification of a certain volume of blood passing through the kidneys in one minute.

It should be noted that an increase in the level of creatinine and urea in acute renal failure are rather late signs, when more than 50% of the nephrons are affected. In severely impaired renal function, the creatinine content in the blood can reach very high numbers - 800-900 μmol / L, and in some cases - up to 2650 μmol / L.

With uncomplicated acute renal failure, the concentration of creatinine in the blood increases by 44-88 μmol / l per day. In acute renal failure with muscle damage (extensive injury), the creatinine level increases more markedly as a result of a significant increase in the rate of its formation. The level of creatinine in the blood and glomerular filtration are recognized as the main laboratory criteria in the classification of chronic renal failure (CRF).

Due to the high reserve capacity of renal hemodynamics, creatinine is not a sensitive indicator of early kidney disease and may remain at the same level when a significant part of the nephrons is affected. Therefore, this test is usually used simultaneously with the determination of urea test No. 1.2.3), which is more sensitive to functional changes in the kidneys. The nature of the food affects the creatinine level to a lesser extent than the level of urea. A slight increase in the content of creatinine in the blood can cause an increased intake of exogenous creatine and creatinine from meat food [5,6,9].

Glomerular filtration rate (GFR) most fully reflects global renal function and forms the basis of the modern classification of «chronic kidney disease».

Calculating GFR is a laborious technique. In clinical practice, simple methods of calculating GFR can be used by measuring serum parameters without collecting daily urine. The application of the formulas D. W. Cockroft and M.H. Gault or MDRD (Modification of Diet in Renal Disease) [17,18].

A simplified version of the MDRD equation for patients with diabetes has been proposed in comparison with the Cockcroft-Goult formula [24].

Angiography remains the «gold standard» for determining renal artery occlusive disease despite the risk of serious complications of the nephrotoxic effect of contrast agents in elderly patients and patients with diabetes. In this regard, the problem of interaction between hyperglycemia and nephrotoxic radiocontrast agents is discussed. It is known that hyperglycemia is a risk factor for acute renal failure when using contrast agents. The pathophysiology of radiotherapy-induced renal injury suggests a vasoconstrictor effect on the renal vessels, leading to hypoxia and direct tubular toxicity. It has been clinically proven that the risk of such complications is reduced with the use of low-osmolar contrast media instead of high-osmolarity and sufficient hydration of the body. However, even in this case, complications develop in diabetic patients 3 times more often than in patients without diabetes [13].

Scintigraphy with captopril is used in patients with preserved nitrogen-excreting renal function and allows not only to effectively diagnose renovascular hypertension, but also to predict a decrease in blood pressure after intervention. During the sample, the GFR is assessed by the radionuclide clearance (Tc-MASZ) before and after the administration of ACE. The renogram indicates pathology if the removal of the radioactive label is delayed. For the test, sufficient hydration, withdrawal of ACE or ARB, diuretics, posing a risk for patients with heart failure, are required. In addition, it is not entirely clear whether a single dose of captopril is safe in individuals at risk of severe renal artery stenosis [15].

Ultrasonic pulse-wave dopplerometry is widely used in clinical practice due to its selectivity, information content, non-invasiveness, versatility. In combination with color Doppler mapping, this method is used in such areas of clinical medicine as cardiology, neurology, obstetrics and gynecology, nephrology, and pediatrics. The indications for the use of this method are constantly expanding [3].

The Dopplerogram reflects the spectrum of blood flow velocities in the vessel during the pulse cycle. The most often used in calculations are extreme values of velocities according to the Doppler signal

data. The quantitative assessment of blood flow through the vessel depends on the angle of insonation. And the arteries, in which the measurement is usually carried out, are often located so that the angle cannot be set correctly. The advantage of relative indicators expressing the ratio of the amplitudes of extreme or averaged Dopplerogram values during the pulse cycle is their independence from the angle of insonation [3,10,21]. Resistance indices in the statistics of renal hemodynamics are used as an indicator of comparison of two values characterizing the level of the studied phenomenon, pulse filling of a separate section of the vascular bed.

In some publications devoted to studies of renal hemodynamics, the terms «resistance index» and «renal vascular resistance» have become equated [20].

At the same time, works appeared where the correspondence of the resistance index to the resistance to blood flow is critically examined. It was experimentally established that the resistance index reflects the integration of arterial compliance, arterial pulsation component and resistance of the distal circulatory bed, which normally determine continuous antegrade diastolic blood flow through the main renal arteries.

According to I.V. Begun's own data (2009), the resistance index correlates with the values of the mean and integral blood flow velocities in the main renal arteries, along with the integral velocity of the filling and ejection fraction of the left ventricle, and the duration of the pulse cycle [3].

Researchers are focusing on the potential role of Doppler sonography in assessing ureteral obstruction [7].

Gray-scale ultrasound research information is often incomplete or misleading. Expansion of the collecting system of the kidneys can be due to such non-obstructive reasons as residual dilatation from previous obstruction, pyelonephritis or reflux. The accuracy of the Doppler diagnosis of obstruction increased when the IR of a potentially obstructed major renal artery was compared with an unaffected contralateral kidney [25].

According to other authors, the sensitivity of Doppler sonography in the diagnosis of obstruction was 52% [16]. Chen J. (1993) notes the impossibility of using the method for bilateral obstruction.

Gray-scale ultrasound can determine the size of the kidneys, the thickness and echogenicity of the parenchyma and help in the diagnosis of chronic renal disease. However, these data are not specific enough. With the advent of the Doppler method, its capabilities are being studied in the diagnosis of non-obstructive kidney disease.

In work performed by J. Platt et al. (2004), the results of kidney biopsy in various pathologies in 41 patients were compared with the IR value of the intrarenal arteries (interlobar and arcuate) [23].

Patients with isolated lesions of the glomerular apparatus had normal IR levels. In vascular or interstitial pathology, an increased level of IR was noted. These data were refuted by G. Mostbeck and co-authors. (2000). Differentiation of the types of glomerulonephritis using Doppler indices of renal resistance, according to [19], turned out to be unreliable.

In some studies, IR is described as a marker of diabetic nephropathy in patients with impaired renal function. However, it did not always reflect the presence of nephropathy in patients with normal renal function. It is known that patients with diabetes mellitus develop glomerular hyperfiltration, which is based on arteriolar vasodilation. A decrease in the level of IR for intrarenal arteries in patients with hyperfiltration [22] is associated with a decrease in renal arterial resistance, which provides an increase in renal blood flow in the diastolic phase. In the study of blood flow in patients with initial hemodynamically significant signs of nephropathy (the phase of hyperfiltration and renal hyperfusion), a significant increase in IR, C / D at the level of the arcuate and interlobular arteries was recorded [10].

There is an opinion that indicators of renal vascular resistance may be associated with systemic diseases and reflect not only the state of the renal transplant [15].

Specific changes in blood flow have been described for arteriovenous fistula and renal vein thrombosis as complications after kidney transplantation. The diagnosis of arteriovenous fistula is confirmed if a decrease in resistance with an increase in diastolic blood flow is determined in the supplying arteries [15].

Despite the share of a negative approach to IR in some studies, this indicator can be effectively used in studies of renal blood flow. When calculating this indicator, it is necessary to take into account the accompanying pathophysiological mechanisms of hemodynamic provision of the kidney, which makes its clinical application more correct.

Selective angiography and radiopaque computed angiography with the introduction of contrast agents (CA) are used everywhere in practical medicine. Therefore, the safety issues of radiopaque studies or interventions using contrast media are of great importance.

Prevention of the nephrotoxic effect of CA, the so-called contrast-induced nephropathy (CIN), remains an urgent problem.

Endovascular interventions are increasingly being performed in severely ill patients of the older age group with multifocal atherosclerosis, diabetes mellitus, arterial hypertension, heart failure, and chronic kidney disease.

The interventions themselves become more complex, multi-stage, with the use of a large volume of CA. The active use of X-ray computed tomography at the diagnostic stage with intravenous CA administration increases not only the total radiation exposure, but also nephrotoxicity.

Dundua D.P. [8] studying the intravenous or intra-arterial administration of X-ray contrast agents in order to determine the anatomy of the vessels, the nature and localization of lesions in them, to assess the blood supply to various organs and tissues, he came to the conclusion that modern isoosmolar and low-osmolar contrast agents (Yodixanol, Yogeksol, Yoversol and Yopromid) do not differ in the frequency of contrast-induced nephropathy. They are equally safe for use in interventional cardiology and angiology. With moderate renal dysfunction, contrast-induced nephropathy occurs in 10% of cases, with normal renal function - in 6.4% of cases. In most patients with moderate renal dysfunction, the use of Yoversol and Iodixanol does not lead to a deterioration in renal function. Initial renal dysfunction, diabetes mellitus, age over 70 years increase the likelihood of developing contrast-induced nephropathy after endovascular intervention [8].

A group of authors has developed a prognostic method for diagnosing the stage of acute renal failure [11], which consists in determining the stage of acute renal failure (serous or purulent). The method is carried out by determining in the patient's urine for the first time the hours of admission to the hospital of a complex of enzymes of the class of oxidoreductases - LDH, SDH, GL-6-FDG. With LDH <1.67, LDH <1.58, GL-6-FDG <21.10 μmol / g protein, the serous stage of pyelonephritis is diagnosed, and with LDH activity> 1.70, SDH> 1.60, GL-6 -FDG> 22.20 - purulent stage of pyelonephritis. The method is simple and can be carried out in the laboratory of an emergency hospital within 2.5 - 3 hours. The diagnostic value of this method is 90%.

The development of the functional direction using various pharmacological stress tests led researchers to the idea of the possibility of using diuretics, beta-adrenergic agonists and drugs that affect the arterial component of renal blood flow. These drugs cause increased functional stress on the kidneys and urinary tract. We used furosemide, ginipral, and vazaprostan to identify latent insufficiency and reserve hemodynamic capabilities of the kidneys and upper urinary tract.

The authors used pharmaco-ultrasonography with a diuretic to improve the diagnosis of papillary tumors of the pyelocaliceal system. As already noted, even with undisturbed passage of urine, a short-term response of the calyx-pelvic system to the introduction of furosemide occurs. Therefore, with ultrasound scanning of the kidney in various planes at the time of the physiologically expanded calyx-pelvic system, it is possible to visualize a volumetric formation in the pelvis, which is impossible with conventional echoscanning.

Ultrasound assessment of the bladder and prostate is widely used in the diagnosis of various diseases of these organs. If you create an increased functional load on the bladder wall by «physiological» overflow, you can get information about the extensibility of the detrusor. In combination with the assessment of the act of urination, this complements the information on the functional state of the bladder, specifies the indications for conservative or surgical treatment tactics for bladder obstruction.

With ultrasound descending polycystoscopy, it is possible to determine the degree of infiltration by the tumor process of the bladder wall, its mobility, which is important to know in the event of an upcoming radical operation. The study should begin on an empty bladder, and then create drug-induced polyuria. At the same time, constant ultrasound control with video recording is required to monitor the dynamics of bladder filling and expansion of its walls [12,13,14].

Until recently, visualization of the urethra was carried out either by an X-ray method using a contrast agent, or by an invasive instrumental method - by urethroscopy. Ultrasound scanning using various sensors in real time with video recording made it possible to perform ultrasound cystourethroscopy at the time of urination. Doppler ultrasonography of urine flow and uroflowmetry performed simultaneously provide maximum information for functional assessment of the act of urination.

It should be emphasized that all ultrasonic functional research methods are subject to registration on videotape, which makes it possible to analyze the data by multiple viewing of video materials.

The combination of ultrasonic microfusion cystourethroscopy with color Doppler mapping of urine flow, as well as the combination of ultrasound microfusion cystourethroscopy with uroflowmetry, expands the diagnosis of functional disorders of the lower urinary tract urodynamics in physiological conditions, allows you to identify their causes and determine their localization.

The foregoing allows us to assert that the methods of functional ultrasound diagnostics are the basis of a new direction in urology. The use of ultrasound methods with various pharmacological loads helps to improve the diagnosis of the disease, assess the functional state of the kidneys and urinary tract. The enormous importance of such information is obvious not only for the purposes of diagnosis, but also for the choice of treatment tactics, assessment of treatment results and determination of the prognosis.

Bibliography

1. Amosov A.V. Diagnostic value of ultrasound scanning in kidney disease: Dissertation work of the candidate of medical sciences. - M., 1982.-P 21.
2. Amosov A.V. Ultrasound methods of functional diagnostics in urological practice: Dissertation work of Doctor of Medical Sciences. - M., 1999.-P 39.
3. Begun I.V., Papkevich I.I. The index of resistance in the diagnosis of kidney disease - opportunities and limitations // Nephrology. -2009.-№4.-P 18-28.
4. Golovanov S.A., Yanenko E.K. and others. Diagnostic value of indices of fermenturia, LPO and excretion of EMS in CP // Urology. 2001. №6. P 3-6.
5. Gornostaeva E.Yu. et al. Vegetative imbalance in patients with metabolic syndrome: a role in the development of hyperfiltration - an early marker of kidney damage // Ter. Arch.-2010.-№6.-P 49-63.
6. Gryakalova E.V. Clinical and diagnostic value of antithrombogenic activity of the vascular wall and the functional state of platelets and neutrophils in patients with chronic glomerulonephritis of

various origins: Abstract of the thesis. Dissertation work of the Candidate of Medical Sciences. - Saratov, 2005. -P 22.
7. Darenkov A.F., Ignashin N.S. Ultrasound examinations in urology. - M., 1994.-P 134.
8. Dundua P.A. Contrast-induced nephropathy in interventional cardiology and angiology: Abstract of the thesis. Dissertation work of the Doctor of Medical Sciences - M., 2010. -P 41.
9. Zaklyakov I.K. Comparative assessment of the clinical and diagnostic significance of some adhesive molecules in the early diagnosis of microangiopathies in patients with diabetes mellitus: Abstract of the thesis. Dissertation work of the Candidate of Medical Sciences. -Astrakhan, 2009. - P 24.
10. Martynov S.A., Shvetsov M.Yu., Kutyrina I.M. The role of ultrasound dopplegography using an acute pharmacological test with captopril in the assessment of renal hemodynamics in chronic glomerulonephritis. // Ter. Arch.-2003.-№6.-P 41-46.
11. Mukhin N.A., Tareeva I.E., Shilov E.M. Diagnosis and treatment of kidney diseases.- M. Geotar-Media.- 2002.-P 384.
12. Pytel Yu.A., Alyaev Yu.G., Demidov V.N. Possibilities of ultrasound scanning in the differential diagnosis of uric acid stones and papillary tumors of the kidney // Urology and Nephrology. - 1991. - N6. -P 8-12.
13. Trofimenko I.I., Dobronravov V.A., Bystrova I.N. The prevalence of a decrease in the glomerular filtration rate in patients with diabetes mellitus // Ter.arch.-2008.-№6.-P 48-52.
14. Khitrova A.N. Differential diagnosis of renal sinus cysts and hydronephrosis by the method of complex ultrasound examination: Dissertation work of the Candidate of Medical Sciences. - M., 1995 .-P 22.
15. Hofer M. Color duplex sonography. A practical guide.-M., Med. Literature, 2007.- 5-53 p.
16. Chen S., Liu Z., Chen H. Glomerular chemokine expression and the effect of steroid and cyclophosphamide pulse therapy in human crescentic glomerulonephritis //Chin Med J (Engl). – 2002.- Vol.115(9).-P.1301-7.
17. Burton C.Y., Walls Y. Proximal tubular cell, proteinuria and tubulointerstitial scarring. //Nephron .-1994.-Vol. 68.-P. 287-293.
18. Diomedi-Camassei F, COQ2 nephropathy: a newly described inherited mitochondriopathy with primary renal involvement.// J Am Soc Nephrol.- 2007.- Vol.18(10).-P.2773-80.
19. Gupta R, Sharma A, Singh S, Dinda AK.Rule-based decision support system in the biopsy diagnosis of glomerular diseases //J Clin Pathol.- 2011.- Jun 10.- [Epub ahead of print].
20. Heine G.H. Renal Doppler resistance indices are associated with sysremic at kidney transplabt recipients //Kidney Int.-2005.-Vol.68.-P.878-885.
21. Hetzel G.R.,May R. Assessment of radiocontrast media induced renal vasoconconstriction by color coded duplex sonography //Ren. Fail.-2001.-Vol.23.-P.77-83.
22. Okuyama H, Kimura S, Atsumi H. Relationship between initial diagnosis and long-term prognosis in lupus nephritis //Nippon Jinzo Gakkai Shi.- 2009.-Vol.51(1).-P.44-50.
23. Pohl M.A., Blumenthal S., Cordonnier D.J. Independent and additive impact of blood pressure control and angiotensin II receptor blockade on renal outcomes in the irbesartan diabetic nephropathy trial: clinical implications and limitations.// J. Am. Soc. Nephrol. -2005.-Vol. 16(10).- P. 3027-3037.
24. Rodby R.A., Rohde R.D., Clarke W.R. The irbesartan type II diabetic nephropathy trial: study design and baseline patient characteristics. //Nephrol. Dial. Transplant.- 2000.-Vol. 15.-P. 487 – 97.
25. Roy-Chaudhury P., Wu B., King G., Campbell M., Macleod A.M., Haites N.E., Simpson J.G., Power D. A. Adhesion molecule interactions in human glomerulonephritis: importance of the tubulointerstitium. //Kidney Int .- 1996.-Vol. 49(1).-P. 127-134.