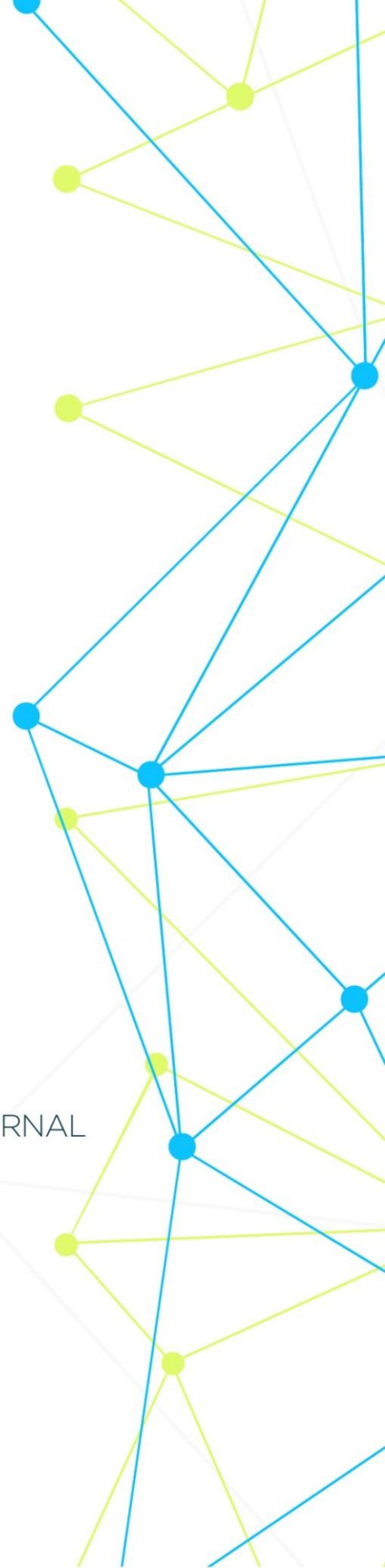




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MODERN VIEW ON THE PROBLEMS OF CARDIORENAL SYNDROME

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Abstract. The kidneys, being an organ involved in important metabolic processes, regulation of the humoral system, microcirculation processes, are subject to acute and chronic effects in various cardiovascular diseases (CVD) and affect the formation and progression of cardiovascular pathology. The purpose of this study was to study the current scientific literature on approaches to early diagnosis, treatment and prevention of cardiorenal syndrome.

Keywords: cardiorenal syndrome, kidney, nephropathy, complication

Relevance. Over the past 10 years, more and more people have been talking about the problem of a “double epidemic” of heart and kidney failure [2,3], since many patients simultaneously have manifestations of these two clinical conditions, which has led to the widespread use of the concept of “cardiorenal syndrome” [4, 19].

The term cardiorenal relationship was first proposed in 2008 in Venice at the ADQI conference. The frequency of occurrence of combined damage to the kidneys and heart is very high. Renal dysfunction determines high cardiac morbidity and mortality even with an initial decline in kidney function. Cardiac pathology is 64% higher in patients with impaired renal function than in healthy ones [1].

Cardiorenal syndrome (CRS) is currently a multidisciplinary problem that requires the efforts of clinicians of various specialties. The study of the causes and mechanisms of the formation of types of cattle, early identification of damage biomarkers and risk factors will help to determine the optimal methods of correction of CRS in order to improve survival and improve the quality of life of patients. Understanding by clinicians of the complex relationship between cardiac and renal dysfunction, the mechanisms of the formation of CRS, the application of this knowledge to practice will contribute to improved diagnosis, timely treatment and prevention of severe complications of cardiovascular and renal pathology and prevention of their progression [5,7].

The purpose of this study was to study the current scientific literature on approaches to early diagnosis, treatment and prevention of cardiorenal syndrome.

The mechanisms of development of cattle are multifactorial and require clarification. CRS occurs already in the early stages of renal dysfunction, and along with with general population risk factors, significant for its development was the influence of factors associated with kidney damage

It is cardiac pathology that determines a significant risk in chronic kidney disease (CKD). Cardiac complications develop more frequently than terminal chronic

renal failure (CRF) [8–11]. According to the NHANES II Study, in patients with CKD, the prevalence of cardiovascular disease (CVD) increases as the glomerular filtration rate (GFR) decreases. As CKD worsens, left ventricular hypertrophy (LVH), systolic and/or diastolic dysfunction, atherosclerosis, and vascular calcification develop [9,10]. In terminal CKD, signs of heart failure are detected in 40% of cases, changes in the left ventricle of the heart - in 85% of cases [5]. This category of patients often has coronary heart disease (CHD) and arterial hypertension (AH) [12]. According to the ARIC study, in patients with stage 2 CKD, new cardiac complications account for 4.8%, and in stage 3–4 CKD, their frequency almost doubles [10]. A large number of studies have proven the link between a decrease in GFR.

Cardiorenal syndrome (CRS) is a syndrome of activation of the general mechanisms of the pathogenesis of damage to the heart and kidneys. CRS is characterized by bidirectionality, when dysfunction of one of the organs is caused by acute or chronic damage to the other [13]. There are five types of CRS:

Type 1 - Acute cardiac dysfunction leading to kidney damage or dysfunction (AKI).

Type 2 - CHF that contributes to kidney dysfunction or damage (CKD).

Type 3 - AKI that leads to acute cardiac injury and/or dysfunction of the heart (AHF, arrhythmia).

Type 4 - CKD, leading to aggravation of heart function, the formation of left ventricular hypertrophy (LVH), an increase in cardiac risk.

Type 5 - systemic diseases (sepsis, diabetes), leading to simultaneous dysfunction of the heart and kidneys.

There are two important aspects in the development of any type of CRS: the first is the sequence of organ involvement and the second is the bidirectionality of action, leading to a vicious circle. These disorders are limited in time (chronic or acute) [14,18]. The development of CRS is associated with the action of pathological factors that adversely affect the function of the myocardium and kidneys. The development of this syndrome involves genetic, metabolic, hemodynamic, neurohumoral factors, disorders of mineral and lipid metabolism [15, 16].

Predispose to CRS: AH, metabolic syndrome, dyslipidemia, anemia, DM, coronary artery disease, renovascular and parenchymal kidney diseases [20]. CRS includes the following pathogenetic mechanisms: 1) dysfunction of the heart as a pump (decrease in cardiac output, increase in venous pressure); 2) oxidative stress, pathological damage to the endothelium, immune response, inflammation, apoptosis; 3) neuroendocrine activation (RAAS, sympathetic nervous system - SNS, vasopressin); 4) disturbance of water and electrolyte balance, accumulation of uremic toxins [17,19]. With the development of kidney or heart dysfunction, the RAAS and SNS are activated, endothelial dysfunction and chronic systemic inflammation

develop. These pathophysiological mechanisms act simultaneously and sequentially, forming a vicious circle leading to accelerated fibrosis and dysfunction of the heart and kidneys: remodeling of the myocardium, vascular wall, and renal tissue [13, 20, 22].

The kidneys, being an organ involved in important metabolic processes, regulation of the humoral system, microcirculation processes, are subject to acute and chronic effects in various cardiovascular diseases (CVD) and affect the formation and progression of cardiovascular pathology. Renal dysfunction is associated with a higher recurrence rate of myocardial ischemia, myocardial infarction (MI), stroke, serious hemorrhagic complications, acute heart failure, atrial fibrillation and ventricular fibrillation. Even a slight decrease in kidney function significantly aggravates the course the main cardiac pathology, while increasing the frequency of complications and the risk of death, and, conversely, a decrease in the contractile function of the myocardium affects the work of the kidneys in the most negative way. The need for early detection of kidney damage in cardiovascular pathology to assess risk, develop a strategy and tactics for managing patients initially contributed to the emergence of such concepts as "cardiorenal anemic syndrome" (2003) and "cardiorenal continuum" (2005).

The pathogenesis of the development of cardiovascular complications that occur in the early stages of renal dysfunction in the case of "classic" CKD and DM is different. If in CKD the determining factor is a decrease in the mass of active nephrons, accompanied by a violation of the depuration functions of the kidneys with the accumulation of metabolic products [6, 21], then in DM the leading role belongs to a metabolic disorder initiated by hyperglycemia, leading to hyperfiltration and intraglomerular hypertension, the occurrence of albumin/proteinuria with a gradual decrease in GFR and loss of renal function [20].

Early diagnosis of CRS makes it possible to start the necessary treatment in a timely manner, prevent the development of complications and reduce mortality, and sometimes prevent the development of severe cardiorenal pathology. Numerous biochemical markers are now known and characterized as accurate, highly reliable, and specific indicators of heart and kidney damage that can be used to diagnose CRS.

Thus, cardiorenal syndrome is the development of chronic kidney disease in patients with chronic and acute kidney injury in patients with acute heart failure.

Cardiorenal syndrome can be diagnosed in 32-90.3% of patients with heart failure. Impaired renal function has an unfavorable prognostic value: it leads to increased mortality in patients with heart failure. It is necessary to timely diagnose the presence of cardiorenal syndrome and take this into account when managing patients with heart failure. Further study is needed to prevent the development and progression of kidney damage in patients with heart failure, which should be the focus of the efforts of a multidisciplinary team.

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