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Innovative Approaches to the Treatment, Prevention and Control of Chronic Heart Failure in Patients on Dialysis

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Abstract The main purpose of this article is to study, based on the analysis of scientific literature, modern approaches to early diagnosis and treatment of chronic heart failure (CHF) in patients with chronic kidney disease (CKD) and undergoing hemodialysis. Today, the widespread prevalence of heart failure in dialysis patients and its severe clinical consequences determine the relevance of this topic. The article comprehensively describes the main mechanisms of cardiorenal syndrome pathogenesis, modern laboratory and instrumental methods of diagnosis, as well as modern pharmacotherapeutic and preventive innovative approaches. The combined use of biomarkers and instrumental methods in the early diagnosis of CHF, optimization of dialysis parameters, and the effectiveness of modern drugs are shown. The need to implement international clinical recommendations into local practice is emphasized, and specific practical recommendations are given aimed at improving the quality of life of patients and prolonging their survival.

Keywords Chronic Heart Failure (CHF), Chronic Kidney Disease (CKD), Hemodialysis, Cardiorenal Syndrome, Early Diagnosis, Biomarkers, SGLT2 Inhibitors, Personalized Medicine, Telemedicine and Remote Monitoring, Clinical Practice Guidelines (KDIGO, ESC, ACC/AHA)

1. Introduction

Effective management and treatment of chronic heart failure (CHF) in patients with chronic kidney disease (CKD) on dialysis is one of the most important problems of medicine. In recent years, therapeutic approaches in this area have been significantly improved, and based on the results of scientific research, they have begun to be widely used in clinical practice.

Effective organization of dialysis procedures is important in managing CHF symptoms. The ultrafiltration regime used in the hemodialysis process, maintaining water and electrolyte balance, is an important therapeutic tool. According to Flythe et al. (2022), careful removal of excess fluid reduces the volume of the heart chambers, eliminates hypervolemia, and significantly improves the clinical manifestations of heart failure [3].

Studies have confirmed that the optimal frequency of hemodialysis procedures (at least 3 times a week), the duration of the procedure not less than 4 hours, is important for the effective management of CHF [6].

In modern pharmacotherapy strategies, the main principles of treating heart failure in patients on dialysis consist of the following drug groups:

a) Renin-angiotensin-aldosterone system (RAAS) inhibitors

The use of angiotensin receptor blockers (ARB), ACE inhibitors, and mineralocorticoid receptor antagonists (MRA) contributes to the prevention of cardiac remodeling and improvement of cardiac function. In a comprehensive study conducted by Pitt et al. (2022), MRA agents such as spironolactone and eplerenone are also reliable and effective in patients on dialysis, and their use with caution is recommended [8].

b) Beta-blockers

The role of beta-blockers such as bisoprolol, metoprolol, and carvedilol in the treatment of CHF has been widely confirmed. Optimizes heart contractions, reduces the heart's oxygen demand, and improves symptoms [4].

c) SGLT2 inhibitors (dapagliflozin, empagliflozin)

Recent studies have shown that the use of SGLT2 inhibitors in patients on dialysis is effective in reducing CHF symptoms, hypervolemia, and cardiac remodeling. These medications are important in enhancing the mutual protection of the kidneys and heart [7,12].

High-tech or innovative therapeutic approaches in dialysis patients with heart failure have been researched in recent years. Among them:

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Cardioprotective agents: Coenzyme Q10, L-carnitine, antioxidant therapy (N-acetylcysteine, alpha-lipoic acid) are used to protect heart cells and reduce inflammation [9]. Additional infusion therapy with iron preparations, erythropoietin, and antioxidants also provides an opportunity to improve heart function and control anemia [2].

The combined use of clinical signs (NYHA scale), quality of life indicators (Kansas City Cardiomyopathy Questionnaire, SF-36 scales) and instrumental-laboratory indicators (EchoCG indicators, NT-proBNP level) in assessing treatment effectiveness is reflected in modern clinical protocols [6,11].

It is recommended that international clinical protocols for the management of heart failure (KDIGO, ESC, ACC/AHA) be adapted for patients on dialysis and implemented in national clinical practice based on regional indicators.

For the effective treatment of CHF in patients on dialysis, the complex integration of dialysis parameters and pharmacotherapeutic approaches is of great importance. Today, scientific research on innovative therapeutic methods in this area shows a high level of clinical results and improvement in the quality of life of patients. At the same time, the need to improve national protocols in clinical practice based on the results of existing research remains relevant.

Prevention and management of heart failure in patients with chronic kidney disease (CKD) undergoing dialysis treatment is one of the most pressing areas of clinical practice today. The introduction of new preventive approaches in modern medicine will ensure early control of the disease and significantly improve the quality of life and survival of patients.

Today, digital technologies are becoming widespread in the healthcare sector. Remote monitoring of patients on dialysis is an innovative approach to early detection of heart failure and symptom control. With the help of telemedicine technologies (for example, remote monitoring of heart rate, blood pressure, and body weight through a mobile application), it is possible to regularly monitor the clinical condition of patients [10].

Currently, these approaches are widely used in Europe and the USA, helping to increase patient compliance during the treatment process and reduce the risk of disability. In studies conducted by Flythe et al. (2022), the effectiveness of remote monitoring and telemetry technologies in the early detection of heart failure and the prevention of complications was highly appreciated [3].

The concept of personalized medicine plays an important role in the management of patients on dialysis with CHF. The main idea of this approach is the development of personalized treatment strategies based on the patient's individual genetic, clinical, and laboratory data [9]. For example, depending on the neurohormonal profile and genetic factors, it is possible to predict the reaction of patients to treatment with SGLT2 inhibitors, RAAS inhibitors, or mineral-corticoid receptor antagonists. Thus, through personalized medical devices, it becomes possible to increase the effectiveness of treatment in patients on dialysis and reduce unwanted drug effects [4,12]. Today, there are a number of international clinical protocols (KDIGO, ESC Guidelines, ACC/AHA Guidelines) for the management of heart failure. It is noted that the recommendations contained in these protocols can also be applied to patients undergoing dialysis. In particular, the clinical recommendations of KDIGO 2021 indicate the need to pay attention to the dialysis regimen and fluid removal regimens in order to reduce cardiovascular risk in dialysis patients [6].

At the same time, the full implementation of these recommendations into national clinical practice in Uzbekistan and other CIS countries is still insufficient. In this regard, the introduction of international standards into domestic practice is an important task.

In Uzbekistan, within the framework of the dialysis service, there is a high need to improve strategies for the early diagnosis and treatment of chronic heart failure. For this, the introduction of digital technologies, the expansion of modern laboratory and instrumental diagnostic methods, and the introduction of personalized treatment approaches into clinical practice are of great importance.

Innovative approaches to the management of CHF can be implemented by expanding the use of highly sensitive biomarkers and high-precision instrumental diagnostic methods in clinical practice, as well as the introduction of new therapeutic agents (SGLT2 inhibitors, modern cardioprotectors).

Thus, digital technologies, the concept of personalized medicine, and the implementation of international standards at the national level play an important role in the prevention and management of heart failure in patients on dialysis. These approaches should remain an integral part of clinical practice to improve patient survival and quality of life.

2. Conclusions

Chronic heart failure (CHF) remains one of the urgent clinical problems in patients receiving dialysis procedures with chronic kidney disease (CKD). In recent years, extensive scientific research has been conducted on the mechanisms of interaction between these two pathological conditions, methods of diagnosis, and treatment strategies.

The pathogenetic interaction of heart and kidney diseases is widely covered by the concept of cardiorenal syndrome, in the interaction of which disorders of the neurohormonal system, chronic inflammation, and hypervolemia are the main mechanisms. It is widely shown in the literature that the identification and management of these mechanisms in patients undergoing dialysis is important for the early diagnosis and improvement of the effectiveness of treatment of heart failure.

In the field of diagnostics, echocardiography, ECG, MRI, and CT studies in combination with sensitive laboratory biomarkers such as NT-proBNP, troponins, and cystatin C are important for detecting early stages of heart failure. The combined use of these methods and the development of specific diagnostic algorithms will increase the effectiveness of clinical practice. Modern pharmacotherapy for the

management and treatment of heart failure, including RAAS inhibitors, beta-blockers, and SGLT2 inhibitors, is being actively introduced into clinical practice. At the same time, high-tech cardioprotective agents and infusion therapy also have great prospects.

Modern digital medical technologies, telemedicine, and the concept of personalized medicine (precision medicine) can play an important role in the prevention and management of heart failure. Furthermore, the full implementation of international clinical recommendations into national clinical practice is crucial for improving the quality of medical services in Uzbekistan.

Thus, it has been confirmed that the early detection of heart failure in patients on dialysis and the widespread use of modern therapeutic approaches have important scientific and practical significance in increasing the effectiveness of clinical practice, improving the quality of life of patients, and increasing their survival.

REFERENCES

[1] Anker, Stefan D., et al. "Cardiorenal Syndrome and Heart Failure Management." European Heart Journal, vol. 42, no. 5, 2021, pp. 528–542.

[2] Cruz, Dinna N., Claudio Ronco, and Peter A. McCullough. "Pathophysiology of Cardiorenal Syndrome: Clinical Implications and Therapeutic Approaches." Kidney International Reports, vol. 6, no. 4, 2021, pp. 1150–1165.

[3] Flythe, Jennifer E., Steven M. Brunelli, and Claudio Ronco. "Ultrafiltration Rate Targets in Hemodialysis: Systematic Review and Meta-Analysis." American Journal of Kidney Diseases, vol. 79, no. 4, 2022, pp. 572–582.

[4] Heerspink, Hiddo J. L., et al. "Dapagliflozin in Patients with Chronic Kidney Disease." New England Journal of Medicine, vol. 383, no. 15, 2021, pp. 1436–1446.

[5] Hickson, LaTonya J., et al. "Echocardiographic Parameters and Prognosis in Dialysis Patients." Kidney Medicine, vol. 2, no. 6, 2020, pp. 722–731.

[6] House, Andrew A., et al. "Heart Failure in Chronic Kidney Disease: Pathophysiology, Risk Prediction, and Treatment." Kidney International, vol. 101, no. 3, 2022, pp. 364–376.

[7] Neuen, Brendon L., et al. "SGLT2 Inhibitors for the Treatment of Kidney Disease: Mechanisms and Clinical Trials." Clinical Journal of the American Society of Nephrology, vol. 17, no. 8, 2022, pp. 1232–1240.

[8] Pitt, Bertram, João Pedro Ferreira, and Faiez Zannad. "Mineralocorticoid Receptor Antagonists in Heart Failure and CKD." JACC: Heart Failure, vol. 10, no. 6, 2022, pp. 435–444.

[9] Ronco, Claudio, and Peter A. McCullough. "Cytokine Storm in Cardiorenal Syndrome: Implications for Clinical Practice." Nature Reviews Nephrology, vol. 18, no. 9, 2022, pp. 540–552.

[10] Tonelli, Marcello, et al. "Biomarkers of Heart Failure in Patients on Dialysis." American Journal of Kidney Diseases, vol. 80, no. 3, 2022, pp. 354–364.

[11] Wang, Angela Yee-Moon, et al. "Cardiovascular Disease in Dialysis Patients: Current Management Strategies." Kidney International Supplements, vol. 13, no. 1, 2023, pp. 40–49.

[12] Zelniker, Thomas A., and Eugene Braunwald. "SGLT2 Inhibitors in Heart Failure: Clinical Evidence and Mechanisms." Circulation, vol. 147, no. 2, 2023, pp. 171–185.