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PATHOMORPHOLOGICAL FEATURES OF CARDIAC ARRHYTHMIAS IN PATIENTS WITH STAGE 1–2 CHRONIC KIDNEY DISEASE

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Introduction

Cardiac arrhythmias have become increasingly common in recent years and are considered one of the potentially life-threatening conditions, particularly in patients with chronic kidney disease (CKD). CKD disrupts multiple organ functions and significantly affects the cardiovascular system.

Arrhythmias — characterized by disturbances in rhythm, rate, and impulse conduction — can be triggered by electrolyte imbalances, metabolic disorders, hypervolemia, and the accumulation of toxins. In the context of CKD, such pathological changes develop earlier and more frequently.Among these patients, ventricular extrasystoles, atrial extrasystoles, and atrial fibrillation are commonly observed. These arrhythmias vary in clinical severity and are often associated with morphological changes in cardiac tissue. Studying their pathomorphology can enhance diagnosis and improve treatment outcomes.

This study analyzes types of cardiac arrhythmias, diagnostic methods, and morphological changes in 55 patients with stage 1–2 CKD.

Keywords: Arrhythmia, chronic kidney failure, chronic heart failure.

Materials and methods

The study involved 55 patients diagnosed with stage 1–2 CKD. The mean age of the participants was 48 ± 6 years. Cardiac arrhythmias were observed in all patients, distributed as follows:

Ventricular extrasystoles – 21 patients (38.2%)

Atrial extrasystoles – 17 patients (30.9%)

Atrial fibrillation – 17 patients (30.9%)

The diagnostic approach included:

Electrocardiography (ECG): to assess rhythm and identify specific arrhythmias.

Cardiac Ultrasound (Echocardiography): for evaluating anatomical changes, chamber dilation, hypertrophy, and contractile function.

Laboratory Tests:

Creatinine levels – for renal function assessment.

Urea levels – indicating nitrogen metabolism disturbances.

Total protein – reflecting nutritional and systemic status.

Blood glucose – to evaluate metabolic background.

Pathomorphological changes in myocardial tissue were examined and correlated with the types of arrhythmias. Special attention was paid to cardiac muscle structure, interstitial tissue, and vascular changes.

Results

The distribution of arrhythmias among the 55 patients was:

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Ventricular extrasystoles – 21 cases
Atrial extrasystoles – 17 cases
Atrial fibrillation – 17 cases
ECG revealed various rhythm disturbances, including altered P waves, changes in QRS complexes, and T-wave morphology. Some cases also exhibited tachycardia and decreased cardiac performance. Echocardiography showed left atrial and ventricular hypertrophy, chamber dilation, and decreased myocardial contractility — changes clearly associated with arrhythmias.

Laboratory findings included:
Creatinine – elevated in most cases (average: 160 ± 25 µmol/L)
Urea – 8.5 ± 1.2 mmol/L
Total protein – 62 ± 4 g/L
Blood glucose – 5.8 ± 0.9 mmol/L
These results reflected significant metabolic disturbances contributing to arrhythmogenesis.
Pathomorphological Findings: Histological analysis of myocardial tissue revealed:dystrophic changes in cardiomyocytes, including vacuolization and glycogen accumulation; interstitial fibrosis – proliferation of connective tissue between muscle fibers;hyalinization of vascular walls – indicating impaired microcirculation; cardiomyocyte hypertrophy – as an adaptive response to hemodynamic overload.
These findings confirm the structural basis of arrhythmias in the context of chronic kidney disease.
Conclusion. Cardiac arrhythmias are common in patients with stage 1–2 CKD and are significantly associated with both functional and morphological changes in the heart. The most frequently detected arrhythmias were ventricular and atrial extrasystoles, as well as atrial fibrillation. Instrumental diagnostics such as ECG and echocardiography, along with laboratory markers, play a critical role in early detection. Pathomorphological changes — such as myocardial dystrophy, fibrosis, and vascular alterations — provide important insight into the underlying mechanisms. Effective management of these patients requires timely diagnosis, continuous monitoring, and pathogenesis-targeted therapy to reduce the risk of complications and improve prognosis.

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