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# ASSESSMENT OF CARDIOVASCULAR REMODELING IN PATIENTS BEFORE AND AFTER KIDNEY TRANSPLANTATION

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**Resume:** Remodeling of the left ventricle is its structural and geometric changes, including the processes of left ventricular hypertrophy and dilation, leading to changes in geometry, sphericity and disorders of systolic and diastolic function. Left ventricular hypertrophy (LVH) is the main preclinical manifestation of damage to the cardiovascular system, increasing the risk of coronary heart disease (CHD), including myocardial infarction, stroke, congestive heart failure, cardiac arrhythmias and conduction, sudden death, general mortality, both in the general population, in patients with arterial hypertension, and among patients with hemodialysis and after kidney transplantation. The article highlights transplantation in patients undergoing elective hemodialysis and patients undergoing kidney allotransplantation.

**Key words:** transplantation; renal allograft; cardiovascular risk; dyslipidemia; coronary heart disease; arterial hypertension; kidney recipient.

In the modern world, kidney transplantation is the optimal method of renal replacement therapy, increasing both the duration and quality of life for patients with terminal renal insufficiency. However, the significant spread of cardiovascular diseases in patients with chronic renal failure determines the high mortality rate in this category of patients. The formation of left ventricular hypertrophy (LVH) – the structural basis of heart failure (HF) in terminal chronic renal failure (CRF) – begins in the early stages of the latter and progresses as it increases. It is known that high values of the left ventricular myocardial mass index (LVMI) negatively affect the long-term survival of patients. However, the pathogenetic mechanisms of LVH after kidney transplantation remain largely unexplored.

**The aim of the study**

This research to determine the features of remodeling of the cardiovascular system among patients before kidney transplantation and within 1 year after surgery. Materials and methods 120 patients were examined at the Republican Specialized Scientific and Practical Medical Center for Nephrology and Kidney Transplantation and the Republican Scientific Center for Emergency Medical Care

**Table 1 Distribution by degrees of arterial hypertension**

| Arterial hypertenzion | Group №1 n=40 | | Group №2 n=40 | | Group №3 n=40 | |
|---|---|---|---|---|---|---|
| | index | % | index | % | index | % |
| I degree | 15 | 37,5 | 20 | 50 | 24 | 60 |
| II degree | 18 | 45 | 12 | 45 | 12 | 30 |
| III degree | 7 | 17,5 | 8 | 5 | 4 | 10 |

men dominated – 73 (58.4%), against 52 (41.6%) women. The ratio of men and women, therefore, was 1.4. The age of patients at the time of transplantation was on average 40.06 ± 10.3 years (from 18 to 65 years). In most cases, terminal renal failure, which caused the patient's need for a donor organ, was caused by chronic glomerulonephritis in 83 (66.4%), in 12 (9.6%) cases by congenital urinary tract abnormalities, in 9 (7.2%) cases by adult-type polycystic kidney disease. Patients with diseases such as diabetes mellitus, urolithiasis, diffuse connective tissue diseases, periodic illness, etc., accounted for 16.8% (21 cases). Most of the patients on the waiting list were on renal replacement therapy.The patients were treated with programmed hemodialysis . The duration of renal replacement therapy averaged 3.82 ± 2.61 years. In general, the duration of the renal history averaged 14.96 ± 7.21 years. At the same time, the vast majority of patients had stage 5 chronic kidney disease (CKD) with creatinine clearance less than 15 ml/min/ 1.73 m2 - 120 (96%) and only 5 (4%) had stage 4 CKD. During the initial and subsequent examinations, anamnesis was collected, blood pressure, heart rate, and electrocardiography were measured using the MAC 1200 ST electrocardiograph (Russia). Echocardiographic studies were performed to determine the functional state of the cardiovascular system. Hemodynamic parameters were evaluated by echocardiography in three modes: M-, B-modal and color Doppler on a PHILIPS HD II XE device (Netherlands) using a 3.5 MHz ultrasound sensor. To assess the left ventricular remodeling process, the mass of the left ventricular myocardium (MMLJ, g) and the mass index of the left ventricular myocardium (IMLJ, g/m2) were calculated. The studied patients were divided into three observation groups: Group 1 – patients before transplantation, group 2 - 6 months after kidney transplantation, group 3 – 1 year after transplantation.

**Results and their discussion**

At the initial examination, the average systolic blood pressure before transplantation was at the level of 174.23 ± 8.72 mmHg, diastolic – 98.72 ±5.43 mmHg, but 6 months after transplantation, the average systolic blood pressure was 152.42 ± 6.73 mmHg, diastolic 85.34 ± 4.56 mmHg., and a year later even lower: the average systolic blood pressure is 135.64 ± 5.27 mmHg, the average diastolic is 82.34 ± 6.23 mmHg. At the same time, analyzing antihypertensive therapy, it turned out that out of 107 patients with hypertension, the majority, namely 63 (58.9%), were on multicomponent antihypertensive therapy (2 or more drugs). It is noteworthy that most of the patients on the waiting list had grade II arterial hypertension at the time of examination, usually of secondary origin (Table 1) Thus, after analyzing the data in Table 1, it can be concluded that in the posttransplantation period, blood pressure control becomes more effective. The degree of remodeling was assessed based on the results of echocardiography. The following factors were considered as factors that could influence the dynamics of left ventricular myocardial hypertrophy: age, duration of renal history, degree of arterial hypertension. According to the results of echocardiography, the average value of myocardial mass and myocardial mass index was significantly higher among patients before kidney transplantation (Table 2).

**Table 2 Indicators of pathological remodeling of the left ventricular myocardium**

| Observation groups | mid,SBP mm hg.col. | mid DBP, mmhg.col | Creatinine clearance, ml/ min/1,73m$^2$ | LVMM, g | LVMI, g/m$^2$ |
|---|---|---|---|---|---|
| Group №1 n-40 | 174,23±8,72 | 98,72±5,43 | 7,96 | 229,32±6,58 | 139,44±7,24 |
| Group №2 n-40 | 152,42±6,73 | 85,34±4,56 | 50,96 | 208,99±5,07* | 117,83±8,63* |
| Group №3 n-40 | 135,64±5,27 | 82,34±6,23 | 50,58 | 201,69±6,05** | 107,99±10,67** |

* – the reliability of the difference in indicators when compared with group 1 at $p<0.05$, ** – the reliability of the difference in indicators when compared with group 2 at $p<0.05$

According to the available data, it can be concluded that the frequency of left ventricular hypertrophy after kidney transplantation progressively decreases up to 6 months after surgery and by the end of the first year after surgery. In order to explain this pattern, the correlation coefficient between the level of systolic blood pressure and the left ventricular myocardial mass index was calculated and a positive correlation was revealed – correlation coefficient r=0.57; Pearson correlation coefficient between myocardial mass index and systolic blood pressure r=0.45. In addition, a correlation was found between LVMI and plasma creatinine clearance ($r = 0.368$; $p < 0.01$).

**Conclusions**

Patients with chronic renal insufficiency of various origins develop complications from the cardiovascular system with the onset of the terminal stage. These changes are manifested by hypertrophy of the left ventricular myocardium, an increase in the mass of the left ventricular myocardium. In the examined patient population, its frequency and severity tended to decrease on average after kidney transplantation, which was determined by achieving target blood pressure levels and improving glomerular filtration rates.

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