

Study of Echocardiographic Changes After Kidney Transplantation in End-stage Renal Disease Patients

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ABSTRACT

Background: Cardiovascular complications are the leading cause of mortality in end-stage renal disease (ESRD) patients. This study aimed to evaluate the efficacy of kidney transplantation on the cardiovascular status in ESRD patients. **Methods:** During 2012 to 2014 and in a cross-sectional study, 181 patients were randomly selected for this study. All patients were followed for periods of 6 and 12 months after kidney transplantation. The patients with ESRD and kidney transplant recipients; the patients with left ventricle ejection fraction <50%, left ventricular hypertrophy, mitral valve regurgitation and tricuspid valve regurgitation were included to study and the patients with kidney transplant rejection, myocardial infarction, high blood pressure with treatment-resistant, high blood pressure and addicted patients were censored. **Results:** one hundred and eighty-one patients had the mean age of 38.52 (range, 16-69 years) that 54.7% were men and the mean duration of dialysis was 3.74 years. There were significant differences after 6 and 12 months compared with before and also 6 months compared with 12 months from kidney transplantation for all echocardiographic findings. The echocardiographic findings improved after 12 months compared with 6 months and also these times compared with before kidney transplantation. **Conclusions:** The results of this study appeared that kidney transplantation had a positive effect on the cardiovascular status of patients with ESRD and improved the cardiac function of these patients.

Keywords: End-stage renal disease, Echocardiography, Kidney transplantation, Cardiovascular disease.

1. INTRODUCTION

End-stage renal disease (ESRD) is a kidney disorder that cardiovascular complications are the leading cause of mortality in these patients (1). This ultimately translates into 10 to 30 times more prevalence of heart failure in dialysis patients than in the general population (2). Transplant recipients experienced improvements in ventricular contractility, the left ventricle ejection fraction (LVEF) and regression of LV hypertrophy (LVH) (3). Stress followed by uremia and hemodialysis can be an important risk factor for cardiovascular disease (CVD) in dialysis patients that this factor product complement, cytokines and other inflammatory factors in the production of vascular inflammation and can cause atherosclerosis and cardiovascular disorders (4). Patients with long-term dialysis have lower cardiac output for various reasons (5) or little or no improvement in LVEF assessed by echocardiography (6). ESRD patients with decreased LVEF refer less for transplantation,

although kidney transplantation significantly decreases those risks, therefore they are at increased risk of perioperative morbidity and mortality (5). Given that long-term dialysis effects on cardiovascular function and cardiovascular problems, cause the direct physical and psychological, economic damages and reduce patient's survival. While kidney transplantation improves cardiac function as well as an increasing in LVEF and improvement of heart problems and survival. Therefore, this study aimed to investigate the efficacy of kidney transplantation on the cardiovascular status in ESRD patients.

2. MATERIALS AND METHODS

Patients

This study was approved by the Ethics Committee of Kermanshah University of Medical Sciences, Kermanshah, Iran. During 2012 to 2014 and in a cross-sectional study, 181 patients were randomly selected from the Kidney Transplantation Center of Emam Reza Hospital. All patients were followed for periods

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Variables	n(%)	Mean ±SD	Range
Age, years		38.52±14.29	16-69
Sex			
Male	99(54.7)		
Female	82(45.3)		
Duration of dialysis, years		3.74±0.79	2-6

Table 1. The baseline characteristics of patients (n=181)

Variable	Before	After 6 months	After 12 months
Left ventricular ejection fraction			
Mean±SD	44.53±4.40	48.61±3.94	50.77±3.28
Left ventricular hypertrophy			
Mean±SD	2.35±0.57	1.95±0.51	1.73±0.47
Mitral valve regurgitation, n(%)			
Mild	33(18.2)	152(84)	171(94.5)
Moderate	127(70.2)	29(16)	10(5.5)
Sever	21(11.6)	0	0
Tricuspid valve regurgitation, n(%)			
Mild	22(12.2)	135(74.6)	166(91.7)
Moderate	127(70.2)	46(25.4)	15(8.3)
Sever	32(17.7)	0	0

Table 2. The comparison of echocardiographic findings before and after kidney transplantation (n=181). Abbreviation: EF, ejection fraction; P<0.05 for after 6 and 12 months compared with before and P<0.05 for 6 months compared with 12 months from kidney transplantation for all variables.

of 6 and 12 months after kidney transplantation. The inclusion criteria were the patients with ESRD and renal transplant recipients; the patients with LVEF<50%, LVH, mitral valve regurgitation (MVR) and tricuspid valve regurgitation (TVR). The exclusion criteria were patients with kidney transplant rejection, myocardial infarction, high blood pressure with treatment-resistant and addicted patients. Age, time after transplantation and changes of echocardiographic findings was registered for each patient. The echocardiography was done by a Cardiologist and with the same method.

Statistical analyses

The data were analyzed with SPSS version 22 software. The T-test was done for the correlation between the means of LVEF and LVH with duration of kidney transplantation. Also, the Chi-square test was done the correlation between the status of MVR and TVR with duration of kidney transplantation. P<0.05 was considered statistically significant.

3. RESULTS

Out of 181 patients with the mean age of 38.52 (range, 16-69 years) that 99 patients (54.7%) were men (Table 1). The mean duration of dialysis was 3.74 years (range, 2-6 years).

Table 2 shows the comparison of echocardiographic findings before and after kidney transplantation in all patients. There were significant differences after 6 and 12 months compared with before and also after 6 months compared with 12 months for all echocardiographic findings (P<0.05). Therefore, echocardiographic findings have improved 12 months compared with 6 months after kidney transplantation and also these times compared with before kidney transplantation.

Variables	Unchanged, n(%)	Improved, n(%)
Left ventricular ejection fraction		
After 6 months	45(24.9)	136(75.1)
After 12 months	14(7.7)	167(92.3)
Left ventricular hypertrophy		
After 6 months	139(76.8)	42(23.2)
After 12 months	104(57.5)	77(42.5)
Mitral valve regurgitation		
After 6 months	44(24.3)	137(75.7)
After 12 months	39(21.5)	142(78.5)
Tricuspid valve regurgitation		
After 6 months	39(21.5)	142(78.5)
After 12 months	29(16)	152(84)

Table 3. The prevalence of changes of echocardiographic findings after kidney transplantation (n=181)

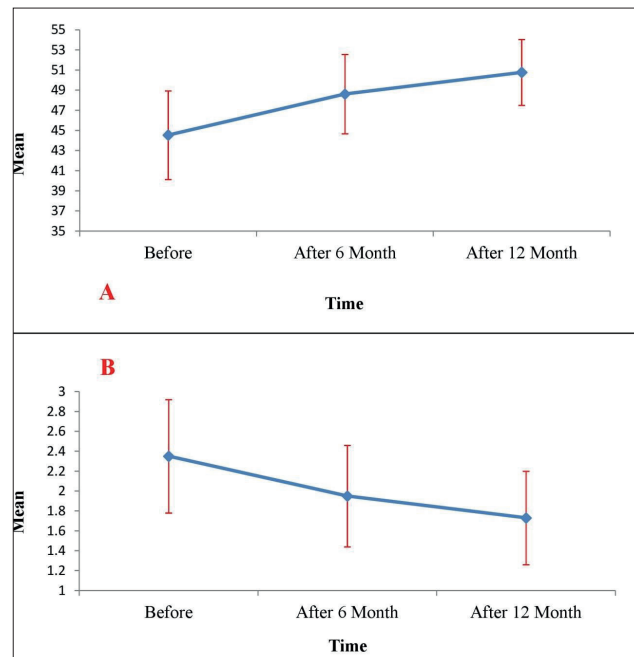


Figure 1. The mean changes of (A) left ventricular ejection fraction and (B) Left ventricular hypertrophy based on echocardiographic findings before and after transplantation in patients over 6 and 12 months after kidney transplantation

The prevalence of changes of echocardiographic findings after kidney transplantation in all patients has been shown in Table 3, Figure 1 and Figure 2.

4. DISCUSSION

Cardiovascular changes related to chronic kidney disease (CKD) are common and a major cause of morbidity and mortality (7). This study showed echocardiographic changes after 6 and 12 months compared with before kidney transplantation. The results showed that echocardiographic findings have improved over time after kidney transplantation. Echocardiographic evaluation plays a pivotal role in establishing the diagnosis of myocardial pathology as well as in stratifying risk and defining the impact of interventions (8) that kidney transplantation leads to normalization of LV contractility in systolic dysfunction, regression of hypertrophy in concentric LVH, and improvement of cavity volume in LV dilatation and therefore, dialysis patients with uremic cardiomyopa-

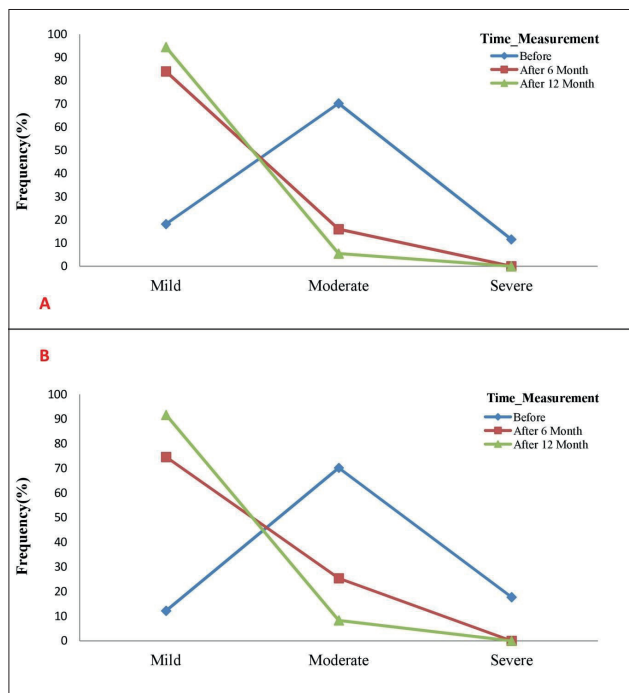


Figure 2. The prevalence of changes of (A) Mitral valve regurgitation and (B) Tricuspid valve regurgitation based on echocardiographic findings before and after transplantation in patients after 6 and 12 months from kidney transplantation

thy would benefit from kidney transplantation (9). Furthermore, the systolic LV dysfunction in terms of LVEF, wall motion, and wall thickening improves significantly 6 months after kidney transplantation in patients with ESRD (10). Tayebi-Khosroshahi et al. (11) showed that mean LVEF before and after renal transplantation was 53.83% and 57.33%, respectively ($P < 0.09$). Several studies (12-17) concluded that in patients with ESRD, successful kidney transplantation could improve the function of LV. Wali et al. (6) Kidney transplantation in ESRD patients with advanced systolic heart failure resulted in an increase in LVEF and improved the functional status of congestive heart failure (CHF). Dziedzic et al. (18) showed that before transplantation, 67% of patients had echocardiographic signs of LVH that after first post-transplant year, 37% of patients remained with LVH (40% reduced). Several studies (11, 14, 16, 19) reported that after kidney transplantation, there was a reduction of the LVH respect to the pre-transplant dialytic status. Tayebi-Khosroshahi et al. (11) reported LVH, MVR, and TVR existed in 46.7%, 76.7% and 33.3%, respectively, which was improved in 30%, 50% and 33.3% after renal transplantation. Bozbas et al. (20) on 500 consecutive patients with ESRD concluded that on echocardiographic examination mean ejection fraction was 51.9%, and wall motion abnormality was detected in 15% of cases. The most prevalent valvular disease was MVR (45.8%) followed by TVR (30.6%). Based on our results, it seems LVEF, MVR and TVR status increased after 6 and 12 months from kidney transplantation. So, after six months of kidney transplantation LVEF (75%), MVR (75%) and TVR (78%) status improved in patients and also after 12 months in 92%, 78% and 84%, respectively. The LVH decreased after 6 and 12 months after kidney

transplantation. So, LVH improved in 23% patients after 6 months and 42% patients after 12 months. The results of this study were in agreement with previous more studies.

5. CONCLUSION

The results of this study appeared that kidney transplantation had a positive effect on the cardiovascular status (based on echocardiographic parameters) of patients with ESRD and improved the cardiac function of these patients. Therefore, a kidney transplant can prevent the progression of cardiovascular and kidney risk of hospitalization that due to the positive impact of kidney transplant on improvement of cardiovascular function of ESRD patients, can propose using it.

- **Conflict of interest:** none declared.
- **Authors contributions:** All authors participated in every step of research and gave final approval of the version to be submitted.

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