

Left ventricular function before and after kidney transplantation

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ABSTRACT

الأهداف: تقييم وظيفة البطين الأيسر (LV) قبل وبعد إجراء عملية زراعة الكلية (KT) بواسطة تخطيط أصداء القلب.

الطريقة: شملت هذه الدراسة 50 مريضاً خضعوا لعملية زراعة كلية (KT) بمستشفى شاهد بهشتي - بابل - إيران، خلال الفترة ما بين أكتوبر 2005م وحتى ديسمبر 2007م. أجريت دراسة تخطيط أصداء القلب بواسطة أخصائي قلب، ثلاثة أشهر قبل وبعد إجراء عملية زراعة الكلية (KT). تم تحليل البيانات بواسطة طريقة (SPSS) لتحليل البيانات الإحصائية وتم اعتبار ($p < 0.05$) ملحوظ إحصائياً.

النتائج: بلغ متوسط عمر المرضى 33.94 ± 11.66 عام. كانت نسبة الذكور من المرضى 66%، 56% كانوا أقل من 45 عام. في هذه الدراسة، ازدادت نسبة الطرح الجزئي (EF) وحجم الجلطة (SV) بعد إجراء عملية زراعة الكلى (KT)، ولكن انخفضت معدلات (LVEDV)، (LVESV)، (LVESD) و (LVEDD).

خاتمة: قد تحسن عملية زراعة الكلية (KT) الناجحة من وظيفة البطين الأيسر مع المرضى المصابين بمرض كلوي في مرحلته الأخيرة.

Objectives: To evaluate left ventricular function by echocardiography before and after kidney transplantation (KT).

Methods: This analytical study included 50 patients that had successful KT in Shahid Beheshti Hospital, Babol, Iran from October 2005 to December 2007. The echocardiography study was performed by one cardiologist before and at least 3 months after KT. Data were analyzed by SPSS, and a $p < 0.05$ was considered statistically significant.

Results: The mean age of patients was 33.94 ± 11.66 years, 66% were male and 56% less than 45 years old. The ejection fraction and stroke volume after KT increased, however, the left ventricular end diastolic volume, left ventricular end systolic volume, left ventricular end systolic dimension, and left ventricular end diastolic diameter decreased.

Conclusion: In patients with end stage renal disease, successful kidney transplantation could improve the function of the left ventricle.

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The heart and kidney are inextricably linked, and their communication occurs at multiple levels. Understanding these systems has become the key to the development of diagnostic and therapeutic targets in cardiovascular medicine.¹ Many studies show that decreasing levels of kidney function act as a major adverse prognostic factor for cardiac events such as atherosclerosis, valvular heart disease (VHD), and myocardial disease.²⁻⁴ Successful kidney transplantation (KT) can significantly improve cardiac function compromised because of end stage renal disease (ESRD),⁵ and some studies⁵ reported that patients with ESRD and severe left ventricular (LV) dysfunction have improved after KT. The aim of this study was to evaluate LV function by echocardiography before and after KT.

Methods. This analytical study included 50 patients who underwent a successful KT in Shahid Beheshti Hospital, Babol, Iran from October 2005 to December 2007. The echocardiography study of LV function

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including left ventricular end systolic volume (LVESV), left ventricular end diastolic volume (LVEDV), left ventricular end diastolic diameter (LVEDD), left ventricular end systolic diameter (LVESD), ejection fraction (EF), and stroke volume (SV) was performed by the same cardiologist for all 50 patients before and at least 3 months after KT. All patients were studied for pericardial effusion and VHD before and after KT. The proposal of this study was approved by the ethical committee of Babol University of Medical Sciences.

Data were analyzed by SPSS using paired t-test, chi-square test, student's t-test, and McNemar's test. A p -value of <0.05 was considered statistically significant.

Results. The mean age of patients undergoing KT was 33.94 ± 11.66 years, 56% were less than 45 years old, and 66% were male. Before KT, the EF in 42% of patients was less than 60%. The parameters of echocardiography before and after KT are shown in Table 1. The EF and SV after KT increased, while LVEDV, LVESV, LVESD, and LVEDD decreased. There was no significant difference between echocardiography indexes in males compared to females, and the age or gender had no significant effect either. The VHD and pericardial disease were also evaluated in this study. Eleven patients had mitral regurgitation (MR) before KT, whereas only one patient showed MR after KT ($p=0.002$). A pericardial effusion was noticed in 3 patients, which improved after KT.

Discussion. In this study, LV function as shown by echocardiography indexes improved after KT, as well as the pericardial effusion, which was not observed until at least 3 months after KT. Other cardiac complications such as MR and tricuspid regurgitation have also shown improvements after KT. Age and gender did not have an effect on improvement of LV function. Siedlecki et

al⁶ studied the relation of LV systolic dysfunction with survival of patients after KT. They found that from 653 patients with KT, 119 patients (18%) had LV systolic dysfunction (EF $<45\%$). Sixty-six patients expired after KT throughout their study, and they concluded that the risk of cardiac events ($p<0.01$) and mortality ($p<0.01$) after KT was higher in patients with LV dysfunction. Sahagún-Sánchez et al⁷ in 2001 studied 13 patients with KT. In this study, 9 patients had left ventricular hypertrophy (LVH) and 6 patients had LV systolic dysfunctions, which improved 3 months after KT. In Larsson et al's study,⁸ LVH also improved in 37% of patients with KT, as well as an increase in EF from 65% to 78% ($p=0.01$). Studying one ESRD patients suffering from congestive heart failure, Okouchi et al⁹ noticed an improvement in EF from 36% before KT to 50% after KT. Iqbal et al¹⁰ evaluated 32 patients with chronic kidney disease (CKD) and obtained the following data before KT: LVH 100%, dilation of LV 58%, and LV dysfunction 18%. Three months after KT those echocardiographic indexes improved ($p<0.01$). A study by Wali et al,¹¹ on 103 patients with CKD that were evaluated before and after KT, showed that EF and LV function improved after KT.

In conclusion, our study revealed significant differences in echocardiographic indexes pertaining to LV function before and at least 3 months after KT. We also showed that MR, tricuspid regurgitation, and pericardial effusion improved after KT, confirming that KT is a treatment for CKD patients suffering from cardiac complications. However, the results of this study should be considered with some limitation. Factors such as blood transfusion, improvement of anemia, and electrolytes abnormalities, corticosteroid administration, and higher quality of care after surgery may interfere with the results. However, the effects of this variable were not significant, as we did not observe any changes in electrolyte abnormalities before and after surgery. Furthermore, the increased hemoglobin concentration after surgery could be attributed to transplantation.

Table 1 - Parameters of echocardiography in patients before and after kidney transplantation.

Parameter	Before KT Mean \pm SD	After KT Mean \pm SD	P-value
EF	59.82 \pm 5.97	63.98 \pm 6.62	0.001
SV	91.64 \pm 20.87	92.38 \pm 23.40	0.824
LVEDV	164.66 \pm 41.67	144.46 \pm 27.89	0.003
LVESV	65.88 \pm 24.29	57.64 \pm 22.62	0.006
LVESD	36.88 \pm 7.20	36.20 \pm 8.07	0.644
LVEDD	54.14 \pm 8.85	50.96 \pm 9.82	0.04

KT - kidney transplantation EF - ejection fraction (percent),
SV - stroke volume (ml),

LVEDV - left ventricular end diastolic volume (ml),

LVESV - left ventricular end systolic volume (ml),

LVESD - left ventricular end systolic diameter (mm),

LVEDD - left ventricular end diastolic diameter (mm)

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