Original Research Article

Effects of Renal Transplant of Echocardiographic Parameters- A Study of Pre and Post-Renal Transplant Cardiac Functions

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Abstract

Background: Chronic kidney disease (CKD) incidence has been steadily increasing world over. CKD has a significant effect on the functioning of the cardiovascular system resulting in significant morbidity and mortality. **Methods:** Patients of CKD undergoing renal transplant were included in the study. Patients echocardiographic parameters were followed before and six months after renal transplant. **Result:** A total of 44 patients were included in the study. There were 30 males and 14 females. The mean age of the male patients was 52±11.2 years and females was 50±10.4 years. Hypertension was seen in 20(45.45%), diabetes in 18(40.91%), CGN in 4(9.09%) polycystic kidney disease in 2(4.55%) as the ethology of CKD. Pre-transplant and post- transplant LVEF was 61.27% and 70.48%, LVEDD was 55.05mm and 46.66mm, LVESD was 33.0mm and 26.34mm. Mitral regurgitation was seen in 72.7% patients pre-transplant and 31.8% patients post-transplant. **Conclusion:** Renal transplant has a favourable impact on the cardiac functions and positively effects cardiac systolic functions and cardiac valvular functions.

Keywords: Chronic kidney disease, renal transplant, echocardiography, left ventricular.

Introduction

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR).

The guidelines define CKD as kidney damage or glomerular filtration rate (GFR) less than 60 ml/min/1.73 m^2 for three months or more, regardless of the cause of the kidney disease [1].

Cardiac disorders are very common in individuals with Chronic Kidney Disease (CKD). According to Foley et al[2], approximately 75% of individuals with CKD who start dialysis have left ventricular hypertrophy (LVH), left ventricle (LV) dilatation or reduced LV fractional

shortening, and these cardiac abnormalities continue to progress in the first year of dialysis[3].

In addition to these alterations, impairment of diastolic function is also common in these patients[4].

Cardiovascular disease is the leading cause of mortality in patients with CKD, undergoing dialysis and accounts for approximately half of all deaths in these patients. Data from the United States Renal Data System 2010 Annual Data Report[5] demonstrated that cardiovascular disease represents approximately 50% of the causes of death, regardless of the duration of dialysis. Currently, with the improvement in surgical techniques and immunosuppressive therapy, kidney transplantation has been considered the standard treatment for patients with end-stage CKD, resulting in reduced mortality compared to dialytic treatment[6]. This improvement in survival after kidney transplantation can be partially attributed to improvement in cardiac function.

End-stage renal disease (ESRD) is considered as one of the most important diseases with a great burden on health care systems. Complications of ESRD on various organs, especially cardiovascular system, are noticeable[7]. Left ventricular hypertrophy (LVH) is a well- established marker of cardiovascular risk in the general population[8]. LVH, which occurs in response to volume and pressure overload, is the prevalent cardiovascular finding in the patients with ESRD, including renal transplant patients (50-70%) [9,10].Renal transplant is the most acceptable treatment modality for the patients with ESRD, which improves some complications of renal failure such as chronic uremia and volume overload[11,12] .

It is reported that successful renal transplantation has positive effects on ventricular hypertrophy and could regress LVH and improve LVEF during the first year after transplantation[12-16]. There is little information about short term echocardiographic changes after renal transplantation.

Aims & Objectives

To study the echocardiographic parameters of Left ventricular ejection fraction, left ventricular dimension, left ventricular hypertrophy and valvular functions in renal transplant recipients before and after kidney transplant.

Materials and Methods

It was a prospective observational study conducted at our centre over a period of two years. This is the only centre in the stated providing tertiary level care for renal ailments and facility of renal transplant.

Inclusion criteria: All the patients of chronic renal disease who underwent renal transplant were included in the study.

Exclusion criteria: Patients with chronic allograft rejection, age above 70 years, severely impaired left ventricular ejection fraction(<25%), body mass index> 35, and patients in remission from cancer treatment < 5 years were excluded from the study.

Echocardiography of the patients was done to know the various cardiac parameters before and 6 months after renal transplant. The

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various parameters noted include diastolic and systolic left ventricular dimensions,ejection fraction, valvular function and diastolic functions.

Results

This study included a total of 44 patients. Demographic parameters of the study population is given in table 1.

Table 1:Demographic parameters of the study population

N (%)		
Sex	Male	30(68)
	Female	14(32)
Age	Male(Mean)	52±11.2years
	female(Mean)	50±10.4years
Causeof CKD	Hypertension	20(45.45)
	Diabetes	18(40.91)
	CGN	4(9.09)
	Polycystic Kidney Disease	2(4.55)

There was significant improvement in the biochemical parameters of the patient after renaltransplant. The pre and 6 months post-transplant biochemical parameters are shown in table 2.

Table 2:Pre and 6months Post-transplant biochemical parameters of the study population

		N(Mean)	Std. Deviation	Std.Error of Mean	p-Value
Urea	Pre-transplant	44(151.77)	83.780	12.63	< 0.0001
	Post -transplant	44(36.23)	11.194	1.687	
Creatinine	Pre-transplant	44(11.132)	8.18	1.234	< 0.0001
	Post -transplant	44(1.072)	0.253	0.0382	

The echocardiographic parameters pre and post-transplant are shown in table 3. There was a significant improvement in the Left ventricular functions of the patients after the transplant.

Table 3:Pre and 6 months Post-transplant Echocardiographic parameters of the study population

		N (Mean%)	Std. Deviation	Std.ErrorofMean	p-Value
LVEF	Pre-transplant	44(61.27)	6.620	0.998	< 0.001
	Post-transplant	44(70.48)	8.487	1.279	
LVEDD	Pre-transplant	44(55.05)	6.762	1.019	<0.001
	Post -transplant	44(46.66)	5.878	0.886	
LVESD	Pre-transplant	44(33.00)	5.405	0.815	< 0.001
	Post -transplant	44(26.34)	5.599	0.844	
LVH	Pre-transplant	24(54.5)	4.922	0.821	0.023
	Post -transplant	18(40.9)	4.02	0811	

LVEF- Left Ventricular Ejection Fraction, LV EDD- Left Ventricular End Diastolic Dimention, LVESD- Left Ventricular Endsysytolic Dimentions,LVH-Left ventricular hypertrophy

The result of valvular functions of the study population is given in table 4

Table 4:Valvular functions of the study population

		Present N (%)	Absent N(%)	Total N (%)	Fishers Extract Test
Mitral regurgitation	Pre-transplant	32(72.7)	12(27.3)	44(100)	0.0001
	Post-transplant	14(31.8)	30(68.2)	44(100)	
Tricuspid Regurgitation	Pre-transplant	10(22.7)	34(77.3)	44(100)	0.057
	Post-transplant	8(18.2)	36(81.8	44(100)	

Discussion

This study was conducted at SKIMS with intent to determine the improvement in the cardiac structure and function following kidney transplantation. In this study, patients were considered irrespective of their sex and residence. Renal transplant has been reported to resolves many of the cardiac abnormalities associated with chronic renal failure. It is demonstrated that renal transplant could regress echocardiographic findings [15]. Also parameters like LVEF, wall motion and wall thickness are improved during the first six months of post- transplantation [17]. Structural and functional cardiac alterations are very common in CKD patients (2) and are associated with morbidity and mortality [18, 19].

The mean urea level before renal transplant was 151.77 mg/dl and after transplant was 36.23mg/dl. This fall in urea level was statistically significant with a p-value of ≤0.0001. Mean creatinine

level before transplant was 11.1325mg/dl and it decreased to a mean of 1.0720mg/dl after transplant. This fall in creatinine level was statistically significant with a p- value of ≤0.0001. This fall in the levels of urea and creatinine after kidney transplant indicates the normal functioning of the graft.

Left ventricular ejection fraction (LVEF) registered an improvement from mean of 61.27% to 70.48% after transplant. This elevation in the LVEF was statistically significant with a p-value of ≤0.0001. This shows improvement in LV functions with improvement in kidney function following transplant. One study, assessing 50 individuals before and 3 months after renal transplantation, demonstrated significant improvement of the ejection fraction and reduction of the chamber diameters [20]. This increase is reported in other studies as well [16,21,22].

The mean left ventricular end diastolic dimension (LVEDd) before transplant was 55.05mm and after transplant it decreased to 46.66mm.This decrease was statistically significant with a p-value of ≤0.0001.We also observed a decrease in mean left ventricular end systolic dimension (LVESd) from 33.00mm before transplant to 26.34mm after transplant. This fall in LVESd is also statistically significant with a p-value of ≤0.0001. This reflects structural improvement in heart with improvement in kidney function after transplant.There are contrasting reports regarding the improvement in LVH following transplantation. In some studies, it has been shown that LVH initiates along with renal failure, increases with renal failure progression, and it will not be even improved by renal transplantation [23,24]. Unlike these findings, it is reported that renal transplantation leads to complete resolution of systolic dysfunction, regression of LVH, and improvement of left ventricular dilatation [12].Another study reported a significant reduction of LVH one year after renal transplant[25].In our study the number of patients having LVH was 24(54.5% of 44) before transplant and after transplant it decreased to to 19(43.2% of 44).The value of Fisher Exact test (0.394) suggests an insignificant change in LVH after renal transplant.Out of a total of 44 patients, Mitral regurgitation(MR) was present in 32(72.7% of 44) patients before transplant and after transplant it was present in only 14(31.8% of 44) and value of Fisher Exact test result being 0.0001 for the above mentioned change. This represents a significant improvement in MR after renal transplant.In comparison to MR, tricuspid regurgitation (TR) was present in lesser number of patients and it showed a statistically insignificant improvement from 10(22.72% of 44) to 8(18.2%of 44) after transplant as suggested by the Fisher Exact test result value of .057.

Conclusion

Renal transplant in patients with chronic renal failure is associated with favourable echocardiographic parameter changes.

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