Severity of Mitral Regurgitation before and after Kidney Transplantation

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ABSTRACT

Background: Perivalvular and valve involvement are prevalent in patients with end-stage renal disease (ESRD), especially in younger patients compared with normal population. Kidney transplantation improves the prognosis of these patients. Patients with cardiac valvular disease is also be improved following kidney transplantation.

Objective: To evaluate the impact of renal transplantation on the severity of mitral regurgitation (MR).

Methods: We studied 95 kidney transplantation candidates in Sina Hospital. The patients underwent echocardiography preoperatively and at the 3rd, 6th, and 12th months post-operatively.

Results: Pre-operatively, the average MR fraction was 30%; MR volume 30 mL/beat; mitral valve mean gradient 1.8 mm Hg; mitral valve area 4.6 cm^2; and mitral annular size 3 cm. No significant difference was observed among the measurements made at the 3rd, 6th, and 12th months post-operatively.

Conclusion: There was no significant association between the variables measured pre- and post-operatively. The reason might be the fact that patients with ESRD in Iran do not have to expect long transplant waiting lists and dialysis cannot affect their heart adversely.

KEYWORDS: Renal dysfunction; Mitral regurgitation; Renal/kidney transplantation

INTRODUCTION

Chronic kidney disease (CKD) affects 13% of the US population [1]. Although a significant proportion of these patients progress to end-stage renal disease (ESRD) requiring renal replacement therapy (RRT) [2] or renal transplantation, cardiovascular disease remains the most common cause of mortality and accounts for 53% of all deaths with a known cause in patients on dialysis [3]. Valvular heart disease is common in patients undergoing maintenance dialysis. Abnormalities include valvular and annular thickening and calcification of any of the heart valves, but commonly the aortic and mitral valves, with the subsequent development of valvular regurgitation and/or stenosis of the affected valve. Many predisposing factors are associated with the development of valvular disease in dialysis patients, perhaps the most significant being the presence of secondary hyperparathyroidism [4-9]. A high prevalence of mitral, tricuspid, and aortic regurgitation is observed in dialysis patients [5, 10]; mitral regurgitation (MR) is the most common [10, 11]. In a series of 75 patients with a mean age of 59 years, valvular regurgitation of the mitral, tricuspid, and aortic valves occurred in 95%, 65%, and 38% of patients, respectively [10]. Moderate and severe regurgitation of the mitral valve occurred in 27% and 13% of patients, respectively. Moderate and severe regurgitation of the tricuspid valve occurred in 13% and 5% of patients, respectively. Moderate aortic regurgitation was present in 4% of patients, while the incidence of severe aortic

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regurgitation was not reported.

The prevalence and degree of regurgitation vary with volume status, degree of left ventricular function, and medications administered (particularly, antihypertensive agents), with changes in volume status being the most significant. One study of 21 hemodialysis patients with both mitral and tricuspid valve regurgitation assessed whether valvular insufficiency disappeared with aggressive ultrafiltration [11]. After intensified sessions resulting in a decrease in body weight of approximately 5.4 kg, mitral and tricuspid regurgitation vanished in 13 and 14 patients, respectively. Among those with persistent abnormalities, the degree of regurgitation was much less severe. Disappearance of regurgitant lesions with aggressive volume and blood pressure control suggests that most valvular insufficiencies in dialysis patients are functional in origin. Valvular calcification appears to be responsible for most of other cases; infective endocarditis (IE) may also result in a regurgitant lesion. In addition, mitral and aortic regurgitation may be more common in polycystic kidney disease; the former due in part to a possibly enhanced incidence of mitral valve prolapse [12]. Herein, we provide a contemporary overview of the pre- and post-operative valvular evaluation of patients with ESRD who were considered suitable candidates for renal transplantation.

PATIENTS AND METHODS

Patients with kidney dysfunction, candidates for kidney transplant at Sina Hospital, enrolled in this cross-sectional study. Patients with moderate to severe aortic stenosis/regurgitation, severe mitral stenosis, rheumatic heart disease or endocarditis, clinical ischemic heart disease or bicuspid aortic valve were excluded from the study. The patients underwent echocardiography prior to the transplantation; it was repeated after 3, 6, and 12 months of the operation to assess the changes, if any.

RESULTS

Overall, 95 (61 male and 34 female) patients were evaluated by echocardiography. The mean age of the patients was 37 (range: 9–64) years. The mean pre-transplant dialysis duration was 19.1 (range: 0–130) months. Causes of ESRD were unknown in 31%, hypertension in 31%, diabetes in 19%, glomerulonephritis in 6%, polycystic kidney in 3%, kidney stone in 3%, and other causes in 6% of patients.

The mean body mass index and hospital stay duration of the patients was 22.3 (range: 13.8–31.9) kg/m^2, and 22 (7–120) days, respectively. The mean pre-operative cardiac ejection fraction (EF) was 50% (range: 20%–65%); the EF in three patients including a 63-year-old man who passed away, a 15-year-old boy, and a 52-year-old woman was 20%. EF changes were not significant after 3, 6 and 12 months of the operation. However, EF increased in the 15-year-old boy and the 52-year-old woman after the transplantation.

The mean pre-transplantation mitral annular size of the patients was 3 (range: 2–3.5) cm; it had no significant change after 3, 6, and 12 months of the operation ($p = 0.1$). The mean mitral valve area was 4.6 (range: 2.5–6) cm^2; it had no significant change postoperatively ($p = 0.12$). The mean mitral valve gradient measured pre-operatively in patients was 1.8 (1.1–4) mm Hg; it also had no significant change after the operation ($p = 0.09$). The mean pre-transplant MR volume was <30 mL/beat; the value did not change significantly postoperatively ($p = 0.35$). The mean pre-transplant MR fraction of the patients was <30%; it had no significant changes postoperatively ($p = 0.25$).

DISCUSSION

Valvular and perivalvular involvement is prevalent among patients with kidney dysfunction; it occurs more commonly in younger patients compared with normal population. The changes are mostly degenerative caused by calcium deposits in valvular tissues, which seem to be associated with hemodialysis dura-

tion. Kidney transplantation has favorable impact on the prognosis of ESRD patients. Provided that valvular problems of the patients can be reduced following kidney transplantation with no need for surgical procedures, this method can be the standard treatment method for ESRD patients with valvular problems and exempt at least one of the patients from undergoing cardiac bypass surgery or other invasive procedures.

Echocardiography is a non-invasive method used for the diagnosis and determining the severity of MR. However, only three patients had severe MR; one passed away due to progressive heart dysfunction two days after the transplantation. The cardiac/valvular condition of the other two patients was remarkably recovered after the transplantation. Nevertheless, there were no significant changes in other patients as there was no severe or even moderate valvular condition.

Our study had some limitations that could cause bias. We had to replace some of the patients due to transplant rejection. Furthermore, three cardiologists were in our study. The low study sample size would be another limitation of the study.

In conclusion, there was no significant relationship between the variables measured pre- and post-operatively. The reason might be the fact that ESRD patients in Iran do not have to expect long transplant waiting lists and dialysis cannot affect their heart adversely.

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